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The AUTOMOBILE

S. A. E. Possibilities

Standardization Society's Foremost Activity —Membership Growth Has Been Prodigious

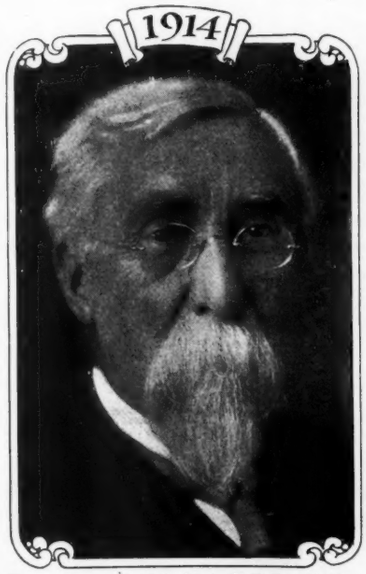
By K. W. Zimmerschied
Second Vice-President

THE Society of Automobile Engineers is 9 years old this summer. Compared with other technical organizations of its kind it is a mere infant in years, and yet a conservative and fair-minded appraisal of its accomplishments during these short 9 years will convince any thoughtful observer that it belongs to the class of infant prodigies.

Membership Growth—A Prodigy

In the number of members it compares most favorably with societies decades old; in the quality of its membership it has no cause for apology. For the vigor with which the objects of the organization are pursued, its committees deserve the highest praise, and for the large benefits which have accrued to the industry as a whole, the society merits the heartiest thanks of automobile manufacturers.

When we speak of the accomplishments of this body, those who know anything at all of its history think immediately of standardization; and I believe we are all agreed that it is indeed fitting that standardization should have been first and foremost among the activities of this society. Standardization is pre-eminently an American conception. It is indissolubly connected with the whole broad subject of efficiency, and certainly we American manufacturers accept no mean estimate of our ability to produce efficiently.



President H. W. LELAND
Society of Automobile Engineers

I have always had a keen personal interest in this subject of standardization—even for the bearing which it has on efficient production, but far more have I encouraged it on behalf of the user. The savings in time, money, trouble, and use of his car, which come to the owner through his ability to get standardized and interchangeable parts are simply enormous, and I venture to say are largely responsible for the almost universal use of the motor vehicle to-day. If matters were still in the chaotic state that obtained when this society was formed, we can easily imagine the pygmy proportions that the automobile industry would have attained to-day!

Wearing the Laurel Wreath

The splendid progress which the Standards Committee has made needs no recounting here. It is available in the Transactions of the Society, and in the admirable collection of Data Sheets, which bids fair to become a pattern for many other societies to follow. It has received the strongest indorsement of leading men in practical touch with all branches of the industry and the most substantial encouragement of administrative officials. What I want to emphasize now is the great future which still lies before this committee of the society.

The editor of a very bright little publication which comes to the desks of many of us has an unique

policy. All commendations and criticisms of his work come to his secretary and are carefully noted; the praises are read and answered politely by this secretary, and the matter ends there, but all signed adverse criticism goes direct to the editor himself, because this man believes that the best incentive to larger accomplishments comes through a realization of one's shortcomings. I do not mean to imply that the Standards Committee has any grievous faults to be corrected, but I do believe that a few suggestions on its future may at least evidence a desire to be of help.

I believe that a larger field awaits the Standards Committee in the elements of our cars. Bolts, clevises, carbureter fittings, and the like have already been standardized to excellent advantage.

The committee should not rest here, thinking its work done, but should consider the progress it has made in the light merely of a successful experiment. There are scores of other parts which may be considered elements in the mechanism, amenable to standardization. Choosing as typical of such parts, I would say that we all use pistons, piston pins, connecting-rods, and crankshafts—can we not have standard types of all or some of these?

I do not mean to say that we will all use the same identical parts, but I do believe that *standard type* parts are feasible, provided these are based upon correct theory and successful experience. Of course, the standardization of such parts requires a large amount of intensive labor, but it ought to be labor well spent, because every hour spent at it will save many hours at a hundred drawing boards—*if* draftsmen will use these parts when standardized.

Exit Bootless Individuality

This brings up a phase of standardization work which should receive aggressive attention in the future—the enlarged use of standard parts, and the discouragement of bootless individuality. We hear at times of engineers who do not use our standard fittings because they have something better. The committee is always glad to hear of such cases because it is made up of men big enough to admit that if some design is better than their standard they will be glad to consider it for a new standard.

But how many more engineers refuse to use standards simply because they want their design to be different! Why do not such engineers realize that meritorious individuality has to do with larger issues than original threads?

The Bridge Builder

Take the case of the bridge designer. Of all products none are more diverse than bridges—every one has to be designed anew, but almost without exception they are assembled from standard angles, channels, plates, and rivets, yet this circumstance does not detract one iota from the originality of the design.

I submit that the automobile engineer would make far faster and better progress if he were furnished with many more standard parts and left free to bend his energies toward the larger issues in automobile design. He ought to realize that a sane and logical program of standardization does not mean a shackling of his initiative, but rather that it would spell emancipation from the drudgery of too much detail. Henry Souther, Chairman of the Standards Committee, puts it very tersely when he says that AN ENGINEER'S VALUE TO A MANUFACTURER CONSISTS TO NO SMALL DEGREE IN HIS ABILITY TO USE STANDARDS.

S. A. E. Sections Are Good

Another feature of this society's work is often mentioned but too seldom taken advantage of by the members—I refer to the section meetings. We all realize that attendance at these meetings requires a certain amount of sacrifice on the part of the members and yet those who make the sacrifice are well repaid, because it is at these meetings that such fruitful discussions arise.

Coker F. Clarkson, secretary and general manager of the Society of Automobile Engineers since January, 1910

Papers of Utmost Value

Well-prepared papers constitute the very backbone of the society's success, and a volume of Transactions should in itself represent a full return for the annual dues, but the additional privilege of hearing and entering into the discussions of these papers is worth as much again. This is so because such discussions often become experience meetings, wherein a very free interchange of ideas takes place; old, successful designers recount their earlier troubles and warn the young men of rocks ahead—the young engineer asks for information and explanation and gets it. Often the tables are turned, and the young engineer fresh from col-

lege gives real help to the old, conservative practitioner.

A seemingly unimportant, yet really valuable advantage also attaches to these discussions, in the opportunity which they offer for public or semi-public speaking. Too often we meet engineers who can put excellent ideas into drawings, but who are absolutely lost when they attempt a word picture. This is a really unfortunate impediment, for it may rob an employer, unversed in technicalities, of much help that he should get from his engineer, and it may easily impede the natural commercial and professional progress of the engineer himself.

The society is doing much to stimulate and improve section activities, but the final success of these lies with the members themselves, and in their cooperation in matters of attendance, preparation of papers, and willingness to discuss their problems freely.

Colleges for Automobile Engineers

This suggests the broader subject of automobile engineering education. For decades, young men desiring to become civil, mechanical, or electrical engineers have had the opportunity of pursuing most excellent courses in these specific branches at any one of a score of our best universities; but the boy aspiring to automobile engineering had to get what benefit he could out of a mechanical engineering course, and then obtain the balance of his preparation from more or less desultory experience.

In the last 2 or 3 years conditions have improved largely, and we find regular automobile engineering courses in four or five of our most progressive universities; in a number of others special courses on subjects germane to the automobile are being offered.

This augurs well for the future of the industry. We can see a new era ahead in our shops, in our offices, and in our society. Empirical methods are going to fall before the advance of scientific analysis, and logical evolution is going to supplant accidental success.

These things must follow if the universities will deliver to young men thorough, honest and judiciously arranged courses, covering the fundamentals of the industry and touching corelated subjects as broadly as possible. But these courses must be taught by men who are exceptionally able engineers themselves, and these engineers must have an exceptional amount of help.

It is here that one of the widest opportunities of the Society of Automobile Engineers opens up. We must realize that the hope of the industry rests with the rising generation, and that the best of the rising generation will probably come to us through the doors of our universities. The society should therefore hasten to afford our universities every assistance possible in the training of these young recruits to its ranks. Already the council has established a student grade of membership, whereby a man, for a nominal sum, may enjoy all the ordinary benefits of the society while he is still a bona fide student.

But we should go further. We should keep in close touch with the faculties of these universities and stand ready to give them any reasonable amount of information, experimental material, or shop facility which they may need. Many of our laboratories are fitted with special equipment which it would be too costly for them to duplicate; much that we can do with special shop machinery in a few hours would take them weeks to finish; many of our test records contain information of a general nature which would require years to duplicate in a laboratory. The door to all these and to a hundred other kinds of assistance should be open to the deserving professor.

I HOPE THAT THE SOCIETY OF AUTOMOBILE ENGINEERS WILL RECOGNIZE THIS OPPORTUNITY AND SEIZE UPON IT IN AN AGGRESSIVE SPIRIT.

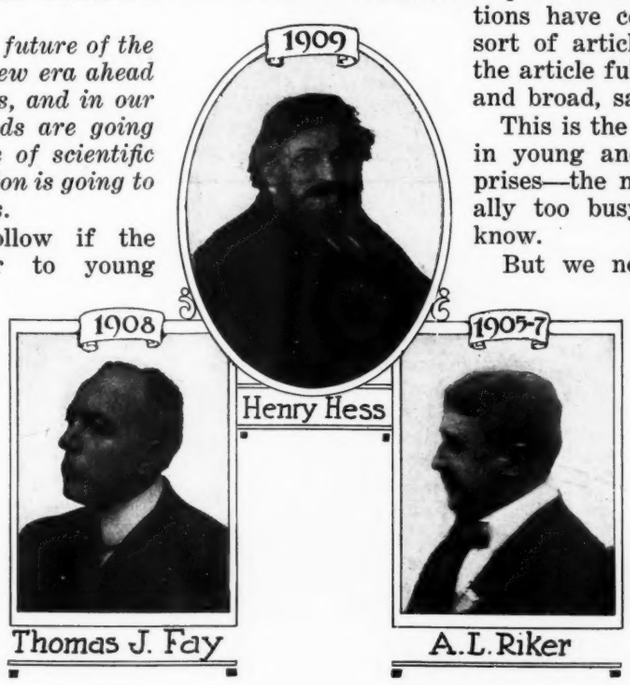
Vincit Omnia Veritas

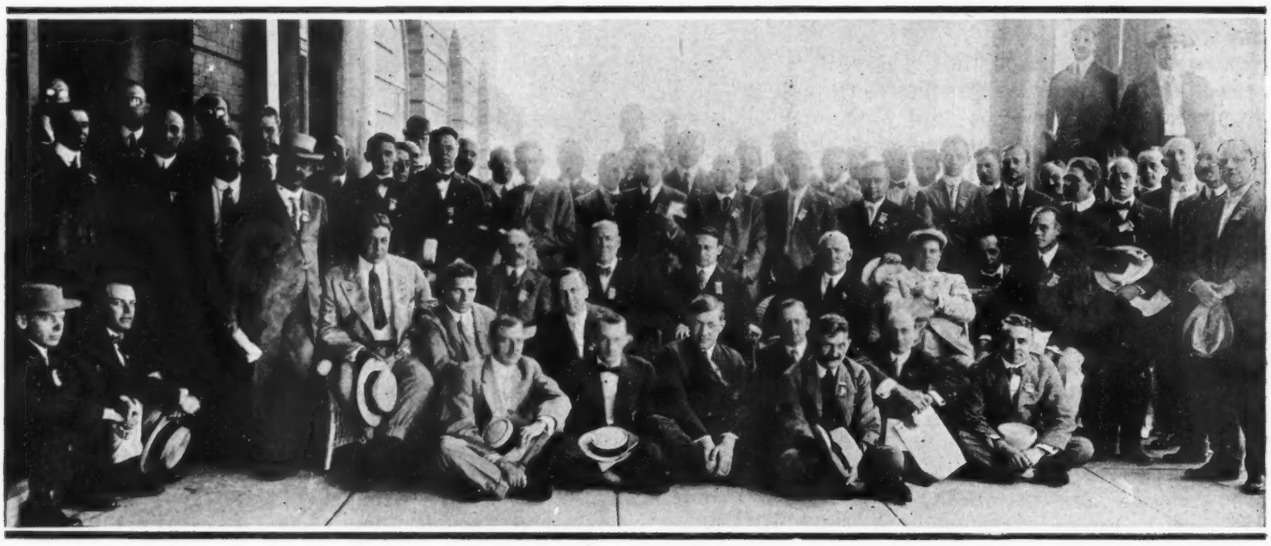
For the things which the society gives to the universities they will get an immediate return in the shape of what I may be pardoned for calling an inoculation of pure science. I know the Transactions have contained too few of that sort of article which is styled classic, the article full of fundamental analyses and broad, safe, formulations.

This is the common fault to be found in young and rapidly growing enterprises—the men who *know* are generally too busy to expound what they know.

But we now have a class of men available who are devoting all their time to the fundamentals of the art—let us hope they will be generous in their response to our need for more light.

And after they have set us a good example, I trust that our ablest technical engineers will be the first to compete with them in quality and quantity of unselfish contribution to our literature.





Part of the Standards Committee of the Society of Automobile Engineers assembled at the opening of the summer session at Cape May, N. J.

Engineers Open Summer Session

Standards Committee Approves Six Reports—Divided on Single vs. Two-Wire Electrical Systems

CAPE MAY, N. J., June 24—*Special Telegram*—President Leland opened the business session of the semi-annual meeting here today at 2 p. m.

His address, which was on Technical Schools and Workshop Training, was listened to with rapt interest. Mr. Leland drew on his own experience and the conclusions reached were based on this long experience in the workshop. Mr. Leland stated that there was a broader field than is covered by the strictly technical discussions which claim the attention of the S. A. E. engineers, and that this field relates to the engineer personally, rather than to his achievements. He said, "No problem is so worthy of your skill and ingenuity and so complex and no reward is so great as that which comes to the man who successfully engineers his life to a higher type of character."

Engineers at the Top

In surveying the civilization of the world, Mr. Leland made the interesting statement that civilization may be considered as a huge pyramid and that the engineering profession stands at the top of this pyramid.

Yesterday the standards committee met and considered the reports from twelve divisions of the committee. Six of these division reports have now been passed on by the committee and will be taken up at the meeting and laid before the Society for their approval before they are accepted as standards. The other six divisions submitted progress reports and the matters under their control were returned to them for further consideration.

The divisions which have had their reports passed on and which are now up to the Society are the Ball and Roller Bearings, Broaches, Electrical Equipment, Iron and Steel, Motor Testing and Pleasure Car Wheels. Those which have reported progress and which will continue their work with a view of bringing a report up at the next winter session of their finding on the Electric Vehicle, Lock Washers, Miscellaneous Research, and Truck Standards divisions.

S. A. E. High Lights

¶ Leland opens meeting at 2 P. M.

¶ Standards Committee reports on
Ball and Roller Bearings,
Broaches,
Electrical Equipment,
Iron and Steel,
Motor Testing,
Pleasure Car Wheels.

¶ Divided on Single vs. Two-Wire electrical systems.

¶ If manufacturers agree bearing sizes can be reduced from 287 to 47.

¶ Eight tire sizes recommended—To replace fifty.

Broaches Report Read

The report of the broaches division which is given in the June Bulletin of the S. A. E., was read by C. W. Spicer, president of the Spicer Mfg. Co. Frank Burgess, general manager of the Boston Gear Works, started the discussion by stating that if nothing important were to be gained by changing practices now in common use, the committee should proceed cautiously as any changes would entail an enormous expense. Mr. Spicer replied that the division had had that in mind in framing the report and that the standards recommended coincided in all except minor details with the practice of leading concerns. It was brought out at the meeting that if the report were accepted by the Society that the broaches as recommended would probably become standard practice almost immediately.

K. W. Zimmerschied, metallurgist of the General Motors Co. read the report of the Iron and Steel Division printed in the June issue of the S. A. E. Bulletin. After 2 years of use these standards remain good practice. There

are not so many steel specifications required now and many have been dropped from the revised report in order to simplify matters. The sulphur content has been raised in this report because it is now impossible to make steels in a commercial way which will be as free from sulphur as formerly.

Letters from the Sheldon Axle Co., Isaac Johnson Castings Co. and the Perfection Spring Co. were read. The latter company objected to the proposed standards because, "they are low standards."

Henry Souther, chairman of the Standards Committee, stated that good automobile parts are being made from the standards as now provided and that if a manufacturer needed better steels he had but to specify them.

One Vs. Two-Wire System?

Joseph Bijur, president of the Bijur Lighting Co., read the report of the Electric Equipment division which is printed in the May Bulletin. It was brought out that the division is considerably divided as to whether or not the single wire system should be recommended. Messrs. Conant, Lee and Kebler, of this division are in favor of the two-wire system as the most electrically correct. Howard Coffin, consulting engineer of the Hudson company, stated that the tendency is toward the single wire system and that from the standpoint of the automobile manufacturer it is best. A. L. Riker, chief engineer of the Locomobile company, also favors the single wire. That part of the report dealing with the insulation tests were said, by W. H. Conant, general manager of the Gould Storage Battery Co., to be for the purpose of forestalling more drastic action on the part of the underwriters. The report was passed.

Too Many Bearing Sizes

In the report of the Ball and Roller Bearings division it was brought out that the number of bearing sizes could be reduced from 287 to 47 if the manufacturers would concur with the efforts of the Standards Committee. There seems to be difficulty in getting the manufacturers into line in this particular work. F. G. Hughes, chief engineer of the New Departure Co., stated that it costs $8,000 to bring out a new bearing size and he was sure that the manufacturers would rather multiply this figure by 50 than by 300. The report will be further discussed at the general meeting.

The Pleasure Car Wheels report which is published in the June Bulletin is the result of a long series of tests on standard makes of rims. David Fergusson, chief engineer of the Pierce company, stated that many customers had specified certain makes of rims which tests had proved to be faulty and that they had been compelled to put them on with the result that many had failed in use. These practical tests coincided with the tests made by the Pleasure Car Wheels division in getting up the set of standard strengths given in the report. Edwin Hall, experimental engineer of the Goodyear Tire company, stated that in testing these rims they were subject to the worst possible conditions and that soft bead tires which gave a lifting component on the rim were used. The work of this division is just beginning, and, as Mr. Souther pointed out, the felloes will be the next point of attention. The division recommends the adoption of eight tire sizes instead of the present fifty at least.

Motor Testing Work

Herbert Chase, laboratory engineer of the A. C. A., described the work of the Motor Testing division and submitted a series of motor test data blanks which were practically the result of the deliberations on this subject at the last winter meeting. The report of the division was accepted with a few typographical changes in the charts.

The matter will be threshed out in the general meeting. The reports of the other divisions were referred back to their respective members. Some comments on the falling off in the use of the standard S. A. E. lockwashers were presented and will be forwarded to that division.

Mr. Leland said in part: "Following the custom of my predecessors in the Presidency, it is my privilege to address you at this time, touching upon some things that are of interest to all engineers.

Not Technically an Engineer

"Technically, I am not an engineer. No institution has ever given me a diploma. When I started my career in 1858 there were few schools where technical engineering was taught. The technical schools which are now found in almost every city, and which for the most part are doing excellent work, were unheard of in those days. The State universities where technical engineering is taught have all come into existence since that time, with perhaps two or three exceptions, and the help that has been given by these institutions, and the advantages which they confer upon the young man who is fortunate enough to avail himself of their instruction can hardly be overestimated.

"What little I know about engineering has come through a long series of training in the workshop, in the manu-

Business Program of the Eighth Annual Summer Meeting of the S. A. E.

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Wednesday, June 24, 2 P. M.

1. Business Session.
2. Professional session.

Report of Research Division—David L. Gallup, chairman.

Report of Iron and Steel Division, Henry Souther, chairman.

Report of Miscellaneous Division—John G. Utz, chairman.

Thursday, June 25, 9 A. M.

Report of Pleasure Car Wheels Division—Henry Souther, chairman.

Tolerance Specified in Connection with the British Standards of Rims for Pneumatic Tires—E. R. Hall.

Possibility and Difficulties of Formulating Acceptable Recommendations for One Standard Felloe Band for Wheels to be Equipped with Pneumatic Tires—C. C. Carlton.

A General Summary of the Truck Tire Situation—J. E. Hale.

Report of Springs Division—Harold L. Pope, chairman.

Ignition and Starting Devices—A. D. Libbey.

Electric Transmission for Motor Cars—J. B. Entz.

Thursday, 2 P. M.

The Ideal Car. Introduction of Discussion—C. E. Davis.

Possible Weight Reduction of Cars—A. P. Brush.

Necessary Elements of Design for a Successful High-Speed Motor—D. McCall White.

Motor Capacity for Motor Vehicles—C. T. Myers.

Report of Electrical Equipment Division—A. L. Riker, chairman.

Report of Electric Vehicle Division—A. J. Slade, chairman.

Report of Broaches Division—C. W. Spicer, chairman.

Friday, June 26, 9:30 A. M.

Professional Section

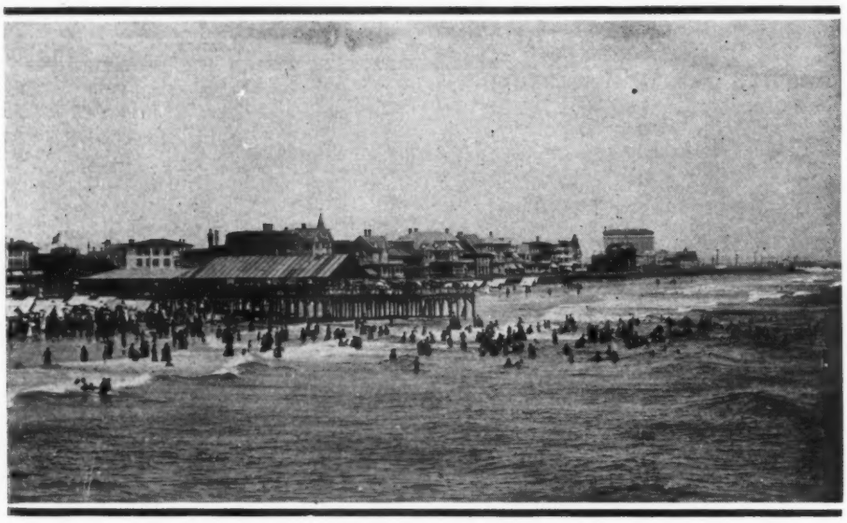
Tap Drill Sizes and Causes of Stripped Threads—H. E. Harris.

Report of Motor Testing Division—J. O. Heinze, chairman.

Report of Ball and Roller Bearings Division—Howard Marmon.

A Proper Basis for Road Vehicle Taxation—C. O. Egerton and S. I. Fekete.

Proper Characteristics for Automobile Engine Oils—Prof. David L. Gallup, chairman.



Warm days have no terrors for the engineers for "the water is fine"

facture of machinery, and in the part I have been able to take in the development and improvement of the engineering and manufacturing methods which during the last fifty years have been so pronounced. Therefore, in my talk to you today I will, if I may, draw upon my experience and the conclusions reached through that long and varied experience, rather than from the standpoint of the trained engineer.

Ethical Engineering

"You hear and read so much pertaining to your profession as automobile engineers in the meetings of your various organizations, local and national, and in your constant discussions of the unlimited details of automobile construction and engineering, that perhaps you will not be averse to a departure from the routine of your accustomed discussion. Therefore, may I make an exception in the character of this address? With your permission I will discuss the matter from a somewhat different and perhaps in some phases a broader outlook than the strictly engineering view usually presents.

A Broader Field

"It is no reflection upon our engineering society to point out that there is a broader field than is covered by the strictly technical discussions which usually claim our attention. However, before discussing this broader field let me say that looking at our great world-wide civilization as a huge and mighty pyramid, I believe that the engineering profession stands at the very top of that pyramid. This is no idle saying to flatter you. In view of the great achievements accomplished by the engineering profession it is a true statement. All the really great achievements which the world enjoys today may justly be placed to the credit of the engineering profession.

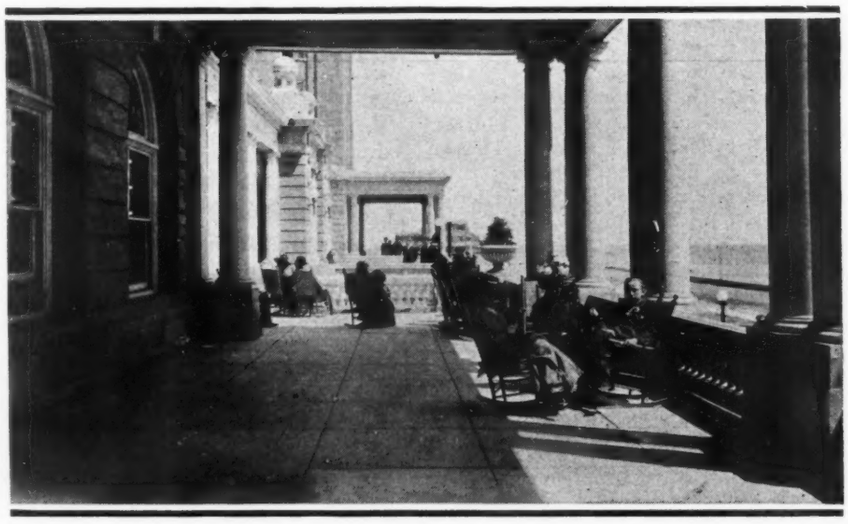
"Nevertheless, great and valuable as have been the achievements of the engineer, I believe there is a larger field which he may occupy if he will. This relates to the engineer, rather than to his achievements. From the vantage point of my years and my experience, may I suggest to you new engineers of a new industry, that in the whole realm of engineering there is no problem so worthy of your skill and ingenuity, and no need so pressing, as that of producing men, not things? No task is so complex, and no reward is so great, as that which comes to the man who successfully engineers his own life to a higher type of character. In the laboratory of daily life, with the mind, heart and conscience as tools, we should, as engineers of the greatest things, convert our baser tendencies and impulses into the noblest realities.

High Aspirations

"May I express the hope that you men, whose genius and application have in so short a time created from nothing, the wonderful automobile industry, will give to the industry such an indelible stamp of personal integrity, unlift and character, that our industry shall forever after stand as a type of the highest and best, as it is now the newest. With this clean manhood as the starting point, and equipped with our theoretical and practical training, we are well qualified to enter upon our work in life and become successful manufacturers or business men. To be a successful business man is more than to amass large dividends. One may distribute enormous dividends and still be a failure as a business man. On the other hand "big business" is not criminal or wrong merely because of its bigness. Every red-blooded man will aspire to a position or business so large that it will tax his whole being to master it. I know of no more important or useful a member of society than the successful manufacturer or business man who is actually producing, devising, or supplying some useful thing; it matters little what so long as the thing produced fills some real need or want and does not in any way degrade or destroy the best ideals of normal human society. The business man or manufacturer who thus produces materials for human needs, who is honest and square in all his dealings, and fair, just and true to every need and requirement of society, is the most important person, and really does the most for society and the world of any human being.

High Standing Abroad

"Let me digress again. We should not be unmindful of the obligation we owe to our employees, our business associates, the laboring man, or of our dependence upon him, but how fallacious is the notion which is now being promulgated that labor itself produces



Broad, cool verandas offer comfortable rest after strenuous committee sessions

all wealth. This is the cry of the demagogue, the partisan, the theorist. Some so-called philosophers are even now getting ready to divide all wealth that all men may be on one common financial level. All wealth and all the useful things ever made, or that ever will be made by men in this universe, have been made by labor plus brains, by labor plus will, by labor guided and controlled by experience, training, initiative, and by the persistency of that living, breathing nature by which some men naturally lead and others naturally follow, by which some best plan and others best execute.

An Engineering Merger

"Perhaps more closely related to engineering interests is our standing and affiliations as engineers. It was my privilege, in 1910, to be entertained, with some of you, by the Institute of Engineers of Great Britain, with a large party of the members of the American Society of Mechanical Engineers. In the summer of 1913 I again had the privilege of going with the same society when we were entertained by the German Engineering Society in twelve of the principal cities of Germany. We were most royally entertained, and the trip was from the beginning a revelation of the most interesting experiences for a mechanical engineer. One thing that impressed itself very strongly upon me was the greater, the better standing which the engineers of both Germany and England seem to have with their governments and communities, as compared with the conditions in our country.

"The annual meeting of the German society held in Leipsic last June was called to order by the Lord Mayor, who made a very fine address. Different important members of the local government were in attendance and took part in the meeting. Members of the Reichstag were present, and the King of Bavaria graced the occasion with his presence, listening to the various papers and deliberations of the meeting. We were informed repeatedly that whenever the government had in contemplation any great engineering feat, or in fact any engineering problem, the authorities having the matter in charge invariably went to the officers of the engineering society and counselled with them in reference to the project.

Meditation of engineering and other problems is profound with such a view as this for inspiration

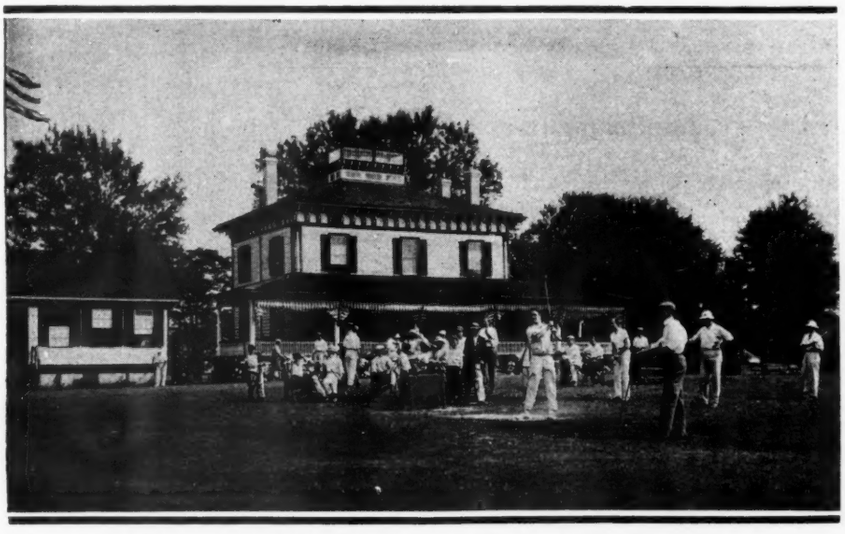
One Great Organization

"In many other ways we saw unmistakable evidence of the better standing of the engineering profession in both these countries than we enjoy here in the United States. In casting about for a reason for this state of things, it occurred to me that it may be due to the fact that in both these countries all the various classifications of engineers are urged together in one great national engineering organization. I presume that each of the various organizations, such as those of the automobile engineers, the electrical engineers, the mechanical engineers, etc., have their own local divisions for conference and discussion. They are, however, all also interested in the great federation of engineers and meetings of this larger and more important organization are held periodically. This gives far-reaching and important dignity and standing to the profession, and I hope that measures will be taken in the not distant future to have all engineering societies in the United States join likewise.

"The automobile engineers of America have the greatest reason to be proud of the progress and development of their profession in the very few years of its existence. History has nothing to record to compare with it. This progress would not have been possible except for the peculiar genius of our trained young men which enables them to think and act quickly and accurately.

Tribute to Clarkson

"The members of the Society of Automobile Engineers have cause to feel pride in their organization which has so quickly and thoroughly shaped itself into the technical heart and head of the industry. It draws together in personal fellowship all members of the great family. It unitedly solves the problems which none alone could master. To the active officers, particularly to our very able Secretary, Mr. Coker F. Clarkson, and to our administrative Council, the Standards and other committees, we are all under lasting obligation for the zeal and fidelity with which they have devoted themselves to our interests. The benefits of the Society have been beyond words. May the future be still richer."



There are excellent links for the ardent devotees of golf

S. A. E. Activities Along Broad Lines

Standardization and Research Work Have Saved Thousands of Dollars to the Automobile and All Allied Industries

THE lines of endeavor of the Society of Automobile Engineers center upon two primary objects. The first and perhaps the most important from a direct viewpoint of financial benefit to the automobile industry is the work of the committee on standardization. The second, and not so easily measured as far as direct results are concerned, is the keeping of important developments in the industry before the attention of the engineers by means of papers on subjects of pertinent importance.

Standards Lacking

Owing to the rapid development of the automobile industry it was not surprising that chaotic conditions prevailed in all parts of the country and practices varied so widely in factories engaged in the manufacture of automobiles that anything like standard practice was remote. Factories sprang up in all parts of the country and the ideas of one designer who built his car in Massachusetts were naturally different from those of another who was busy in a small machine shop in some town in the middle West.

The bicycle business, out of which graduated many who joined the ranks of automobile manufacturers, had practices of its own and it was only natural to find many of these practices contained in the early automobiles. Likewise the practices of the carriage builders found their way into the pioneer automobile factories. The wire wheels of the early days, for instance, were but over-sized bicycle wheels and the frames were similar to those of a horse-drawn vehicle. When the art had advanced far enough for concerns to launch forth into the business of manufacturing accessories, they had many difficulties. A carbureter for one car would not fit the manifold of another. A magneto manufacturer would have to make a differently shaped base to meet the supports of each different car.

U. S. Rubber Building, in which the S. A. E. makes its headquarters

Accomplishment

Some of the Things the Society Has Meant to the Industry

More than 200 Standards adopted.
Establishment of Employment Bureau.
Valuable research work in progress.
There are now 1853 members enrolled.
Papers of world-wide importance read.
Valuable social acquaintances made.
Standards have saved many thousands.
Prominent Engineers on research work.
Discussions incorporated in transactions.
Local sections keep up with progress.

When the automobile business settled down to the status of a steady industry, it was not long before those of the engineering profession who were engaged in both the design of the actual vehicle and the accessories realized that a considerable saving would be effected by the use of standards. On the actual vehicle this made itself felt particularly on small parts. The brake clevises are a good example of this. When the time came for an automobile factory to put through a changed design in order to bring out a larger car for instance, many of these parts had to be re-designed in order to bring them up to the required strength.

The designs for the new car would be put through the draughting room and in working out each small detail such as a brake clevis the individual ideas of the draughtsmen would be incorporated. A loss of money to the firm employing the draughtsman occurs immediately because instead of merely being required to open the S. A. E. data book to the page containing all the details of the clevis, he had to figure out an entirely new clevis and consult various handbooks and other sources of information to make sure that the part he designed was neither too large nor too small for the stresses to be imposed upon it when it was incorporated in a car.

Loss in Making

What loss occurred in the draughting room however, was small compared to what was lost in the actual manufacture of the part. A special die had to be made for each design of clevis. And if the clevises were made outside by a concern that was making clevises for many different concerns building cars of approximately the same size, this concern was compelled to carry in stock a supply of different styles of dies for every automobile factory that patronized it, an inefficient method.

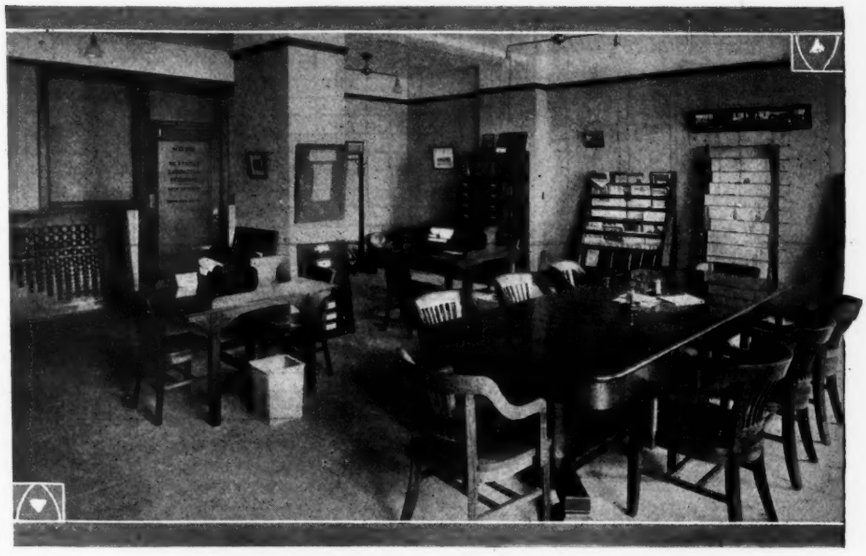
It is the same all through the

car. The construction of an automobile has now become so standardized in many particulars that many parts of definite design are used as a matter of course. Such small details as lock washers, etc., which are now made according to the standards of the society in a minimum number of sizes to accommodate the needs of the designer were formerly made in hundreds of different odd sizes and dimensions. It is also the same in the specifications for iron, steel, bronze, aluminum, etc. The actual saving in dollars to the industry through this branch of activity of the society will never be known, but that it is appreciated is shown in the hearty support given the society.

Papers of Utmost Value

The day is rapidly passing when the short-sighted policy of secrecy in scientific matters is pursued by the broad minded factors of industry. Improvements in the arts and sciences have been made more rapidly in the past 25 years than ever before and an immense proportion of this advance has been due to the presentation of papers and their open discussion before the engineering societies of the world. The Society of Automobile Engineers, in arranging its program of work, has paid as much attention to advance along this line as it has in the work of standardization.

To carry on the labor of standardizing as many parts of the automobile as possible a standards committee composed of a number of divisions, each in charge of a particular line of endeavor, has been formed. In carrying out the selection of papers the society has kept pace with the rapid development of the art and the papers have always been on subjects which followed the development of the industry closely. The discussions of these papers have brought to light information that would, in ages past, have been kept a secret. In these discussions companies have compared many of their methods for the sake of seeking the best and, while no definite financial figure can be placed on what the gain has been, there is no doubt that the facts brought to light have resulted in the building of better cars.



Meeting room at the headquarters of the Society of Automobile Engineers

Two meetings of the society are held annually and the papers which have been prepared are then read and discussed. The records of these papers and discussions are then published in the Transactions of the society and serve as a permanent source of reference.

Two Meetings Annually

The meetings are generally held in January and June. The January meeting is, as a rule, held in New York City at the time of the annual automobile show, thus offering the engineers an opportunity to attend the show and the meeting on one trip. The summer meetings are held in a section of the country where an opportunity will be afforded for relaxation as well as to attend the professional sessions. At the two meetings the work of the standards committee which has been finished during the interim is passed upon by the society as a whole.

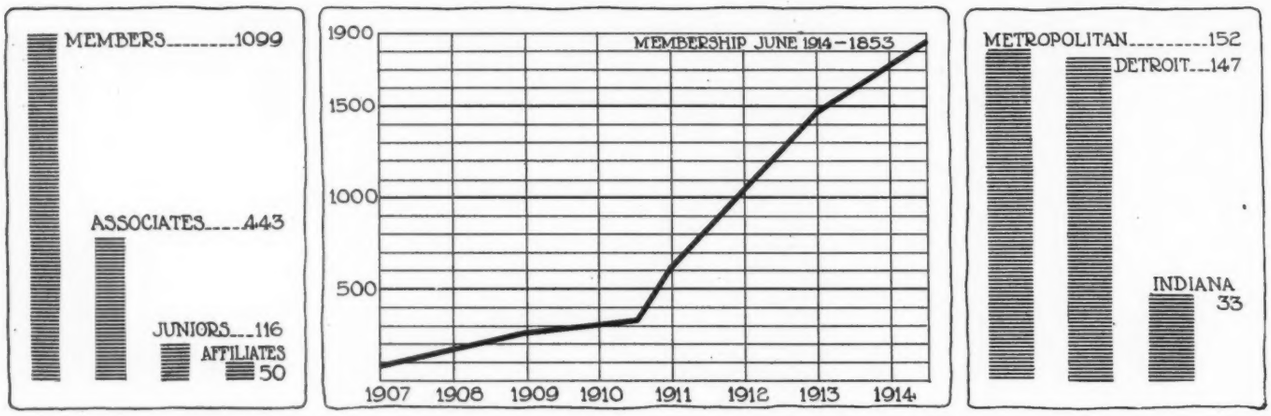
Adopting a Standard

In adopting a standard, it is first decided upon by the division of the standards committee which has that particular branch of the work in hand. After the division has threshed out the matter of its adoption thoroughly, it reports the results of its work to the standards committee at the next meeting. The report of the standards committee is then brought before the entire society and it is voted upon. Work which has not been finished by the time of the semi-annual meeting is referred back to the division of the standards committee which has it in charge for further consideration. All the standards are of a progressive nature. That is, after a standard has been adopted the society is not bound to stand by that particular standard forever. The standards are changed, modified or abandoned as the case may be in keeping up with the progress of the art.

Headquarters in Rubber Building

The headquarters of the society are in the U. S. Rubber Building, New York City. They are on the twelfth floor and have a northern view overlooking the entire reach of Central Park. The society occupies a suite of four rooms and employs an office clerical staff of eight people. In the office the business of the society is carried out in an efficient way under the supervision of an able general manager. Detail work is shortened by the aid of

Transactions and bound volumes of the S. A. E. Monthly Bulletin



Composition of membership—Curve of growth of membership since beginning of Society. Membership in each of three sections

such devices as a mechanical letter sealer and stamper. During the month before the meeting now in session an average of 2,000 letters per week were sent out from the Society headquarters on society business.

The United States Rubber building located at Columbus Circle, New York City, is a good example of the modern office building. It has the dignity that the headquarters of an engineering society should have, being constructed of a white Vermont marble to a modified Renaissance design. It has twenty floors. The building is located in the center of Automobile Row and a majority of the offices in the building are those of concerns engaged in the automobile business, thus putting the headquarters of the society at the heart of the industry as it is represented in the Metropolis.

The work of the society is not allowed to languish during the interval between the summer and winter meetings. There are three active sections of the society located in New York, Detroit and Indianapolis which hold monthly meetings at which papers are presented of an importance which vie with that of the papers presented at the semi-annual meetings of the whole society. The membership of the section at Indianapolis, which is known as the Indiana section, is thirty-three, that of the Detroit section 147 and the Metropolitan section 152.

Monthly Bulletin

In addition to the regular transactions the society issues a monthly bulletin in which the papers which are read before the various sections are printed and the discussions which these papers draw forth from the members of the various sections are generally taken down by a stenographer and reprinted in the bulletins. The papers presented before the meetings of the sections are often of an important nature and as invitations are sent to prominent members of the trade interested in the paper some warm debates ensue which are direct sources of profit to the archives of the society. Debate brings out points which would otherwise remain hidden.

Probably the most valuable single feature of the S. A. E. is the handbook that it issues to members. At present it consists of two volumes containing in the neighborhood of 400 pages of valuable information. It is safe to say that this book is the most valuable single feature, because it is of great utility as a reference-book to everyone connected with the automobile business in a technical capacity.

The two volumes are bound in leather and the books are constructed on the loose-leaf principle so that it is possible to keep the book exactly up to date. As soon as new sheets are issued they can be inserted. This work is facilitated by using the first letters of the alphabet as subscripts to the original page numbers on new pages. For example, if a new sheet is issued that should go between pages 32 and 33, then this sheet will be numbered 32a.

It has been the aim of the Society to include in these volumes not only the standard sets of specifications but also any other data that might be useful to its members, and therefore at the present time it may well be said that these volumes are the automobile engineer's Kent.

Data sheets are a valuable asset

In the first volume are contained the specifications and standard dimensions for the various parts that have been standardized, such as adjustable yoke ends, spark plug shells, standard screw threads, taper fittings, spline fittings, carbureter fittings, magneto and air pump dimensions and so forth.

In addition the specifications for various materials used in automobile constructions are listed. For example, there are seven grades of carbon steel in which the percentage of carbon and manganese are given and the amount of sulphur and phosphorus limited. The heat treatment is also recorded.

Formulas are given for the calculation of chain sizes and lengths, and standard test specimens for the various steels and cast irons are illustrated with dimensions.

The various horsepower formulas, in more or less common use, are to be found together with some charts and tables based on these formulas, and a table showing the compression pressure for a given amount of clearance is given.

The piston displacement for both four and six-cylinder motors is given in a complete table and another table shows the piston speed for various strokes and revolutions per minute.

In the second volume, the first fifteen or twenty pages contain formulas for calculating the strength of various members. The moments of inertia of different sections are given and other data necessary in making strength calculations.

There are complete tables of weights and measures and conversion tables from the metric to the English system, and also some tables giving the important physical characteristics of the common metals, fuels, etc.

Data on the comparative thickness of wire gauges in decimals of an inch and wire and sheet metal gauges in decimals of an inch are also to be found.

1,853 Members All Told

The work of the S. A. E. carries with it the co-operation of practically every prominent engineer in the automobile industry. These men not only appreciate the good the society is doing but are found in many instances to be actually in the ranks of those whose activities are advancing the society. The membership has grown to a total of 1,853 including all grades of membership. It took from 1906 to 1910 to reach the 500 mark in membership. In 1911 it had reached 1,000 and in 1912 practically 1,500. According to the constitution of the society the membership consists of honorary members, members, associates, juniors, affiliate members and international members.

In the work of the standards committee men are selected to work on its various divisions who are specialists in the particular line of endeavor of the particular committee or division and in this way the result has told. In the words of the chief engineer of one of the largest manufacturers, "The Standardization work of the S. A. E. has been of so much use to us that it is just the same as having all the trained engineers who are on that committee on our own staff". Frequent meetings are held by the divisions and sub-committees of the standards committee at the headquarters in New York and each semi-annual meeting of the whole society marks a giant stride in the standardization work as a result of the preliminary work which is accomplished by those who meet in the interval.

Social Work of Importance

The opportunities for increasing their social acquaintance is an attractive feature for members of the society. This is particularly true of the summer meetings to which a number of the members bring their wives and children. A large share of the time at these summer conventions is given over to entertainment and the sections engage in friendly rivalry in athletic events.

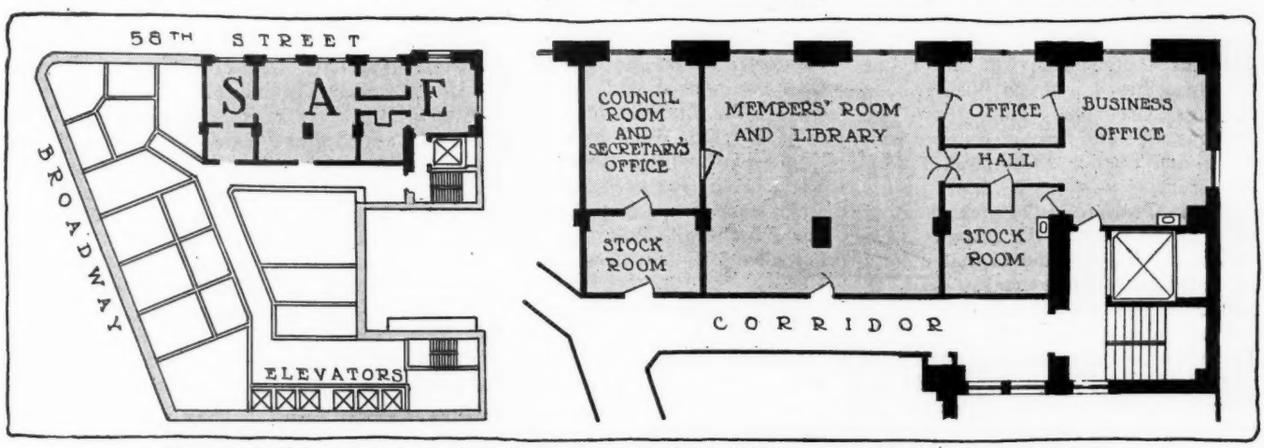
Map showing distribution of S. A. E. members in the different states

Employment Bureau

Another activity of the society which is assuming important proportions is the employment bureau. In each monthly issue of the bulletin a list of positions and a list of those open for employment are published. Members of the society who are desirous of obtaining the services of competent men are rapidly learning that the society itself is the proper place for the men they require for it stands to reason that members of the society are those who are most closely in touch with the developments of the industry.

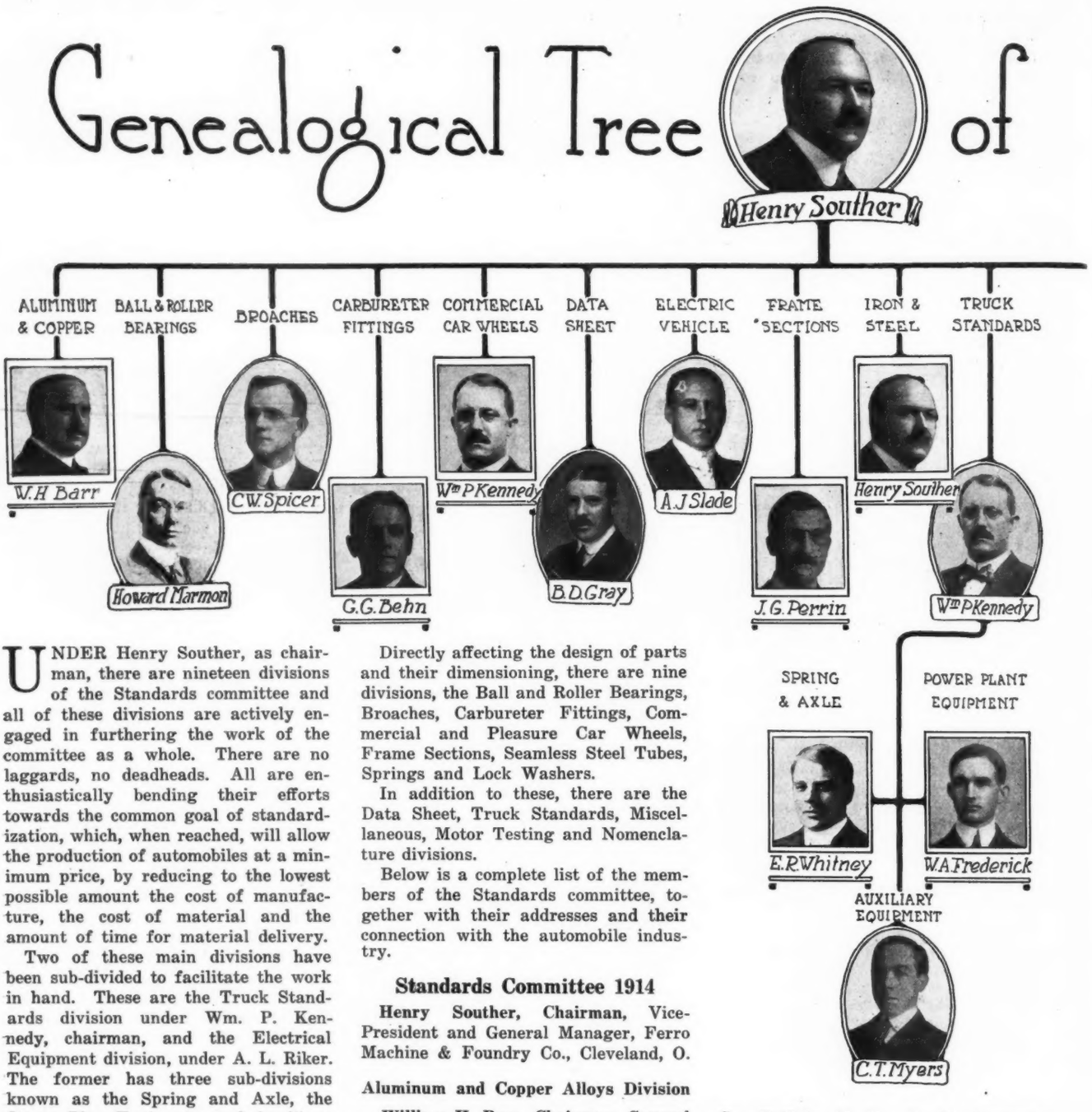
The activities of the society cannot be reviewed without a mention of the European trips. The custom of making these expeditions from time to time was originated in November, 1911, when forty members of the society spent 2 months in England. This visit was returned in May, 1913, by several members of the Institution of Automobile Engineers of England who toured through the eastern and middle western states visiting the automobile plants and the Indianapolis race on Decoration Day.

This visit, however, will be returned next Fall as the S. A. E. is planning a trip to Europe for all those engineers that can go. The start is to be made on Oct. 9 and it is expected that the party will arrive back in New York City on Nov. 2. In this way, by visiting Europe every 2 years or so and having the European engineers come to America some time in these intervals, the members of the Society are able to keep in fairly close touch with what progress is being made in Europe and not only to benefit by the new ideas in car design obtained abroad but also to note the methods of manufacture. On the other hand when the European engineer visits the American factories he not only helps himself but in expressing his opinions of the methods in vogue may offer valuable criticisms as well as well-merited praise.



Plan of the floor occupied by the S. A. E. in the Rubber building, and layout of the S. A. E. rooms

Genealogical Tree of



UNDER Henry Souther, as chairman, there are nineteen divisions of the Standards committee and all of these divisions are actively engaged in furthering the work of the committee as a whole. There are no laggards, no deadheads. All are enthusiastically bending their efforts towards the common goal of standardization, which, when reached, will allow the production of automobiles at a minimum price, by reducing to the lowest possible amount the cost of manufacture, the cost of material and the amount of time for material delivery.

Two of these main divisions have been sub-divided to facilitate the work in hand. These are the Truck Standards division under Wm. P. Kennedy, chairman, and the Electrical Equipment division, under A. L. Riker. The former has three sub-divisions known as the Spring and Axle, the Power Plan Equipment and Auxiliary Equipment divisions. The latter has four branches, the single Wire System Fittings, Grounded versus Two-Wire Systems, Use and Care of Storage Batteries, and Tests and Standards for Installation.

A classification of the nineteen divisions is not easy as the scope of each division is little related to that of any other division. There are two divisions on materials, one on Aluminum and Copper, and one on Iron and Steel. There are two also that deal with electrical matters, although their fields are distinct, the Electric Vehicle and Electrical Equipment divisions.

Directly affecting the design of parts and their dimensioning, there are nine divisions, the Ball and Roller Bearings, Broaches, Carbureter Fittings, Commercial and Pleasure Car Wheels, Frame Sections, Seamless Steel Tubes, Springs and Lock Washers.

In addition to these, there are the Data Sheet, Truck Standards, Miscellaneous, Motor Testing and Nomenclature divisions.

Below is a complete list of the members of the Standards committee, together with their addresses and their connection with the automobile industry.

Standards Committee 1914

Henry Souther, Chairman, Vice-President and General Manager, Ferro Machine & Foundry Co., Cleveland, O.

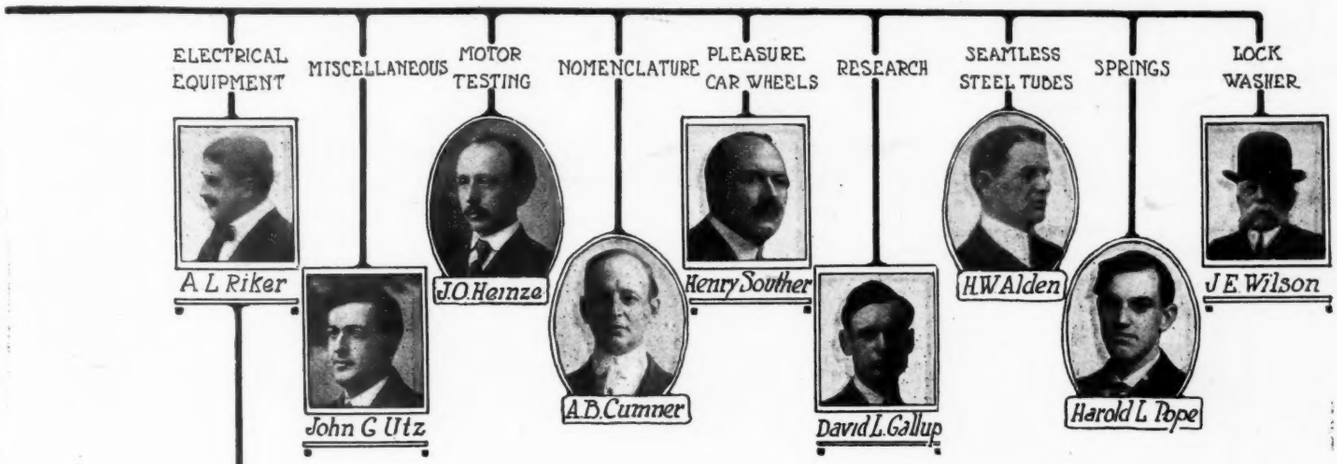
Aluminum and Copper Alloys Division

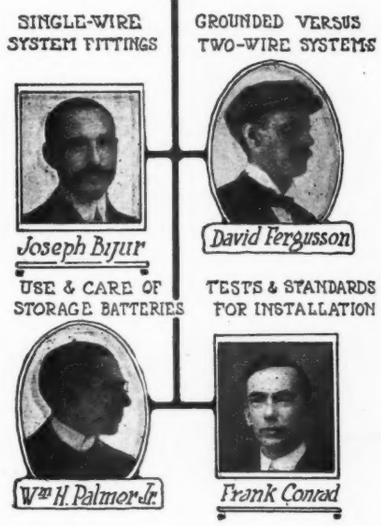
William H. Barr, Chairman, General Manager, Lumen Bearing Co., Buffalo, N. Y. Jerome J. Aull, Mechanical Engineer, the Lunkenheimer Co., Cincinnati, O. Geo. W. Dunham, Consulting Engineer, Chalmers Motor Co., Detroit, Mich. E. S. Fretz, President and General Manager, Light Mfg. Foundry Co., Pittsburgh, Pa. Geo. M. Holley, President, Holley Bros. Co., Detroit, Mich.

Ball and Roller Bearings Division

Howard Marmon, Chairman, Secretary, Nordyke & Marmon Co., Indianapolis, Ind. David Fergusson, Mechanical Engineer, Pierce-Arrow Motor Car Co., Buffalo, N. Y. F. M. Germane, Assistant General Manager, Standard Roller Bearing Co., Philadelphia, Pa. B. D. Gray, Vice-President and Manager, Hess-Bright Mfg. Co., Philadelphia, Pa. F. G. Hughes, Chief Engineer and Production Manager, New Departure Mfg. Co., Bristol, Conn. F. J. Jarosch, Chief Engineer, J. S. Bretz Co., New York City. M. T. Lothrop, Metallurgist, Timken Roller Bearing Co., Canton, O. A. L. Riker, Vice-President and Chief Engineer, Locomobile Co. of America, Bridgeport, Conn. M. W. H. Wilson, Assistant Superintendent, Cadillac Motor Car Co., Detroit, Mich.

the S A E Standards Committee





Broaches Division

C. W. Spicer, Chairman, President Spicer Mfg. Co., Plainfield, N. J. J. F. Barr, Secretary, Treasurer and General Manager, Gear Grinding Machine Co., Detroit, Mich. F. L. Eberhardt, President and General Manager, Gould & Eberhardt, Newark, N. J. Ralph R. Lapointe, Mechanical Engineer Lapointe Machine Tool Co., Hudson, Mass. G. E. Merryweather, President, Motch & Merryweather Machinery Co., Cleveland, O. E. C. Peck, General Superintendent, Cleveland Twist Drill Co., Cleveland, O. G. A. Weidely, Vice-President and Chief Engineer, Premier Motor Mfg. Co., Indianapolis, Ind.

Carbureter Fittings Division

G. G. Behn, Chairman, Chief Engineer, Hudson Motor Car Co., Detroit, Mich. Jerome J. Aull, Mechanical Engineer, the Lunkenheimer Co., Cincinnati O. George M. Holley, President, Holley Bros. Co., Detroit, Mich. Howard Marmon, Secretary and Engineer, Nordyke & Marmon, Indianapolis, Ind. C. W. Stiger, President, Stromberg Motor Devices Co., Chicago, Ill. E. E. Sweet, Consulting Engineer, Cadillac Motor Car Co., Detroit, Mich.

Commercial Car Wheels Division

William P. Kennedy, Chairman, Consulting Engineer, New York City. J. A. Anglada, Consulting Engineer, New York City. C. B. Hayes, President and General Manager, Hayes Wheel Company, Jackson, Mich. Russell Hoopes, Superintendent, Hoopes Bros. & Darlington, Inc., Westchester, Pa., Westchester, Pa. A. M. Laycock, Chief Engineer, Axle Department, Sheldon Axle Company, Wilkes-Barre, Pa. J. Morat, Mechanical Engineer, Isaac G. Johnson & Co., Spuyten Duyvil, N. Y. A. J. Scaife, Engineering Department, White Company, Cleveland, O. A. J. Slade, Consulting Engineer, Room 1414 Times Bldg., New York City. Charles L. Schwarz, Manufacturer Spring Wheels, Philadelphia, Pa. E. R. Whitney, Chief Engineer, Commercial Truck Co. of America, Twenty-seventh and Brown streets, Philadelphia, Pa. C. B. Whittlesey, Secretary and Factory Manager, Hartford Rubber Works Co., 691 Park street, Hartford, Conn. T. F. Phillips, Member of Metropolitan Section, 1790 Broadway, New York.

Data Sheet Division

B. D. Gray, Chairman, Vice-President and Manager, Hess-Bright Mfg. Co., Phiadelphia, Pa. A. M. Dean, Palmer & Singer Mfg. Co., Long Island City, New York, Flushing, L. I. J. H. Hertner, Mechanical Engineer, Rauch & Lang Carriage Co., Cleveland, O., Cleveland, O. William V. Lowe, Engineer and New England Representative, Hess-Bright Mfg. Co., Philadelphia, Pa. Harold L. Pope, Mechanical Engineer, Pope Mfg. Co., Hartford, Conn. Henry Souther, Vice-President and General Manager, Ferro Machine & Foundry Co., Cleveland, O. E. S. Foljambe, Managing Editor, The Chilton Co., Market and Forty-ninth streets, Philadelphia, Pa.

Electrical Equipment Division

A. L. Riker, Chairman, Vice-President and Chief Engineer, Locomobile Co. of America, Bridgeport, Conn. V. G. Apple, General Manager, Apple Electric Co., Dayton, O. G. G. Behn, Chief Engineer, Hudson Motor Car Co., Detroit, Mich. W. L. Bliss, Chief Engineer, United States Lighting & Heating Co., Niagara Falls, N. Y. C. M. Bunnell, Edison Lamp Works, General Electric Co., Harrison, N. J. W. H.

IRON AND STEEL
G. F. Fuller, E. F. Russell, F. W. Trabold, W. P. Barba, T. Towne, K. W. Zimmerschied. E. L. French

LOCK WASHERS
F. S. Sayre, C. E. Davis

ALUMINUM AND COPPER ALLOYS
Geo. W. Dunham, E. S. Fretz, Jerome J. Aull

ELECTRICAL EQUIPMENT
Alden L. McMurtry, V. G. Apple, C. M. Bunnell, Russell Huff, Leonard Kebler

Conant, Detroit Manager, Gould Storage Battery Co., Detroit, Mich. Frank Conrad, Electrical Engineer, Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa. David Fergusson, Mechanical Engineer, Pierce-Arrow Motor Car Co., Buffalo, N. Y. Edward A. Halbleib, General Manager, North East Electric Co., Rochester, N. Y. Russell Huff, Consulting Engineer, Packard Motor Car Co., Detroit, Mich. Leonard Kebler, President, Ward Leonard Electric Co., Bronxville, N. Y. A. L. McMurtry, Consulting Engineer, Sound Beach, Conn. R. J. Nightingale, Manager Auto Sales, Willard Storage Battery Co., Cleveland, O. Wm. H. Palmer, Jr., Assistant Engineer, Electric Storage Battery Co., Philadelphia, Pa. G. R. Wadsworth, Engineering Manager, Gray & Davis, Boston, Mass. H. W. Harper, President, Howard Miniature Lamp Co., Ampere, N. J. Jos. Bijur, President, Bijur Motor Lighting Co., Hoboken, N. J.

Electrical Equipment Sub-Committees — Fittings for Single-Wire Systems

Jos. Bijur, Chairman, President Bijur Motor Lighting Co., Garden and Fifteenth streets, Hoboken, N. J. Frank Conrad, Electrical Engineer, Westinghouse Electric and Manufacturing Co., East Pittsburgh, Pa., Leonard Kebler, President, Ward Leonard Electric Co., Bronxville, N. Y.

Grounded Versus Two-Wire Systems

David Fergusson, Chairman, Mechanical Engineer, Pierce-Arrow Motor Car Co., Buffalo, N. Y. G. G. Behn, Chief Engineer, Hudson Motor Car Co., Detroit, Mich. Russell Huff, Consulting Engineer, Packard Motor Car Co.

Use and Care of Storage Batteries

William H. Palmer, Jr., Chairman, Assistant Engineer, Electric Storage Battery Company, Philadelphia, Pa. W. L. Bliss, Chief Engineer, United States Lighting & Heating Company, Niagara Falls, N. Y. W. H. Conant, Detroit Manager, Gould Storage Battery Co., 88 East Congress street, Detroit, Mich. R. J. Nightingale, Manager of Auto Sales, Willard Storage Battery Company, Cleveland, O., 2071 West Eighty-seventh street, Cleveland, O.

DATA SHEET
William V. Lowe

CARBURETER FITTINGS
Jerome J. Aull, Howard Marmon, E. E. Sweet

BALL AND ROLLER BEARINGS
F. J. Jarosch, F. G. Hughes, F. M. Germane, M. W. H. Wilson

SPRINGS
R. L. Morgan, C. E. Clemens, A. C. Schulz, M. P. Rumney

Tests and Standards for Installation

Frank Conrad, Chairman, Electrical Engineer, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Leonard Kebler, President, Ward Leonard Electric Co., Bronxville, N. Y. Alden L. McMurtry, Consulting Engineer, Sound Beach, Conn.

Electric Vehicle Division

Mr. A. J. Slade, Chairman, Consulting Engineer, Room 1414, Times Bldg., New York City. J. R. Coleman, Chief Engineer, Atterbury Motor Car Co., Buffalo, N. Y. R. S. Fend, Chief Engineer, Woods Motor Vehicle Co., Chicago, Ill. Emil Gruenfeldt, Chief Engineer, Baker Motor Vehicle Co., Cleveland, O. J. H. Hertner, Mechanical Engineer Rauch & Lange Carriage Co., Cleveland, O. Benjamin Jerome, Engineer, Couple Gear Freight Wheel Co., Grand Rapids, Mich. William P. Kennedy, Consulting Engineer, 1790 Broadway, New York City. J. M. Lansden, 236 West Fifty-ninth street, New York City. W. H. Conant, Detroit Manager, Gould Storage Battery Co., Detroit, Mich. Ernest Lunn, President, Walker Vehicle Co., Chicago, Ill. W. J. B. Thomas, Chief Engineer, Century Electric Co., Detroit, Mich. P. D. Wagoner, President, Gen. Veh. Co.,

Long Island City, N. Y. C. A. Ward, Secretary, Ward Motor Vehicle Co., New York City. E. R. Whitney, Chief Engineer, Commercial Truck Co. of America, Philadelphia, Pa. W. E. Holland, Research Engineer, Anderson Electric Car Co., Detroit, Mich.

Frame Sections Division

J. G. Perrin, Chairman, Chief Engineer, Lozier Motor Co., Detroit, Mich. C. E. Clemens, Mechanical Engineer, Perfection Spring Co., Cleveland, O. A. L. Riker, Vice-President, Locomobile Co. of America, Bridgeport, Conn. W. R. Strickland, Principal Assistant Engineer, Peerless Motor Car Co., Cleveland, O.

Iron and Steel Division

Henry Souther, Chairman, Vice-President, Ferro Machine & Foundry Co., Cleveland, O. W. P. Barba, General Sales Agent, Midvale Steel Co., Philadelphia, Pa. F. D. Carney, General Superintendent, Pennsylvania Steel Co., Steelton, Pa. E. L. French, Manager, Sanderson Bros. Works, Crucible Steel Co. of America, Syracuse, N. Y. G. F. Fuller, Secretary, Wyman & Gordon Co., Worcester, Mass. Arthur Holmes, Engineer, H. H. Franklin Mfg. Co., Syracuse, N. Y. J. A. Mathews, General Manager, Halcomb Steel Co., Syracuse, N. Y. Geo. L. Norris, Engineer of Tests, American Vanadium Co., Pittsburgh, Pa. J. H. Parker, Metallurgist, Carpenter Steel Co., Reading, Pa. E. F. Russell, 220 Longmeadow street, Longmeadow, Mass. C. F. W. Rys, Metallurgical Engineer, Carnegie Steel Co., Pittsburgh, Pa. Thomas Towne, Engineers' Club, 32 West Fortieth street, New York City. F. W. Trabold, Manager Sales Department, J. H. Williams & Co., Brooklyn, N. Y. K. W. Zimmerschied, Chief Metallurgist, General Motors Co., Detroit, Mich.

MOTOR TESTING
Herbert Chase, R. C. Carpenter, W. G. Wall

MISCELLANEOUS
E. E. Sweet

MOTOR TESTING
H. L. Connell, G. W. Dunham, J. A. Moyer

ARRANGEMENTS
W. B. Cumner

NOMENCLATURE
W. C. Marshall, T. J. Fay, A. L. Clough, H. E. Coffin

Lock Washer Division

J. E. Wilson, Chairman, Mechanical Engineer, National Lock Washer Co., Newark, N. J. C. E. Davis, Engineers' Club, 32 West Fortieth street, New York City. E. W. Hart, Manager, Washer Department, Hobbs Mfg. Co., Worcester, Mass. F. S. Sayre, Assistant to Manager, Positive Lock Washer Co., Newark, N. J.

Miscellaneous Division

John G. Utz, Chairman, Consulting Engineer, Perfection Spring Co., Cleveland, O. G. G. Behn, Chief Engineer, Hudson Motor Car Co., Detroit, Mich. E. H. Ehrman, Secretary, Chicago Screw Co., Chicago, Ill. David Fergusson, Mechanical Engineer, Pierce-Arrow Motor Car Co., Buffalo, N. Y. Arthur Holmes, Engineer, H. H. Franklin Mfg. Co., Syracuse, N. Y. N. B. Pope, Technical Editor, Motor Trades Publishing Co., 1790 Broadway, New York City. A. L. Riker, Chief Engineer, Locomobile Co. of America, Bridgeport, Conn. E. E. Sweet, Consulting Engineer, Cadillac Motor Car Co., Detroit, Mich.

Motor Testing Division

J. O. Heinze, Chairman, Chief Engineer, Northway Motor Co., Detroit, Mich. R. C. Carpenter, Professor Experimental Engineering and Consulting Engineer, Sibley College, Cornell University, Ithaca, N. Y. Herbert Chase, Laboratory Engineer, Automobile Club of America, Fifty-fourth street, New York City. H. L. Connell, Technical Correspondent, 509 Free Press Bldg., Detroit, Mich. Geo. W. Dunham, Consulting Engineer, Chalmers Motor Co., Detroit, Mich. J. A. Moyer, Professor in Charge of Department of Mechanical Engineering, Pennsylvania State College, State College, Pa. W. G. Wall, Chief Engineer, National Motor Vehicle Co., Indianapolis, Ind.

COMMERCIAL CAR WHEELS
A. J. Scaife, A. M. Laycock, Charles L. Schwarz, C. B. Whittelsey, H. D. Church, A. J. Slade, Russell Hoopes, J. A. Anglada

SEAMLESS TUBE
J. J. Dunn

TRUCK STANDARDS
E. F. Russell, C. B. Whittelsey, C. E. Clemens, H. D. Church, Robert McA. Lloyd, F. W. Trabold, A. H. Ehle, Bruce Ford, C. L. Schwarz

ELECTRIC VEHICLES
R. S. Fend, W. P. Kennedy, Ernest Lunn, P. D. Wagoner, Benj. Jerome

RESEARCH
James A. Moyer, R. C. Carpenter, C. B. Veal

FRAME SECTIONS
W. R. Strickland

PLEASURE CAR WHEELS
C. C. Carlton, C. B. Whittelsey, J. G. Vincent, H. Marmon, R. S. Bryant, E. R. Hall, C. B. Williams, C. A. Woodruff

Nomenclature Division

Arthur B. Cumner, Chairman, Transportation Engineer, 1790 Broadway, New York City. A. L. Clough, Associate Editor, *Horseless Age*, New York City. H. E. Coffin, Vice-President, Hudson Motor Car Co., Detroit, Mich. T. J. Fay, Manager, Rockefeller Motor Co., Cleveland, O. P. M. Heldt, Editor, *Horseless Age*, 250 West Fifty-fourth street, New York City. W. C. Marshall, Consulting Engineer, Federal Sugar Refining Co., 91 Wall St., New York City.

Pleasure Car Wheels

Henry Souther, Chairman, Vice-President, Ferro Machine & Foundry Co., Cleveland, O. H. L. Barton, Assistant Director of Production, General Motors Co., Detroit, Mich. R. S. Bryant, Consulting Engineer, Standard Welding Co., Cleveland, O. C. C. Carlton, Firestone Tire & Rubber Co., Akron, O. E. R. Hall, Experimental Engineer, Goodyear Tire & Rubber Co., Akron, O. Howard Marmon, Secretary and Engineer, Nordyke & Marmon Co., Indianapolis, Ind. J. G. Vincent, Chief Engineer, Packard Motor Car Co., Detroit, Mich. C. B. Whittelsey, Secretary, Hartford Rubber Works, Hartford, Conn. C. B. Williams, Treasurer, Mott Wheel Co., Utica, N. Y. Clarence A. Woodruff, Assistant Superintendent, American Tube & Stamping Co., Bridgeport, Conn.

Research Division

David L. Gallup, Chairman, Professor Gas Engineering and Consulting Engineer Worcester Polytechnic Institute, Worcester, Mass. R. C. Carpenter, Professor Experimental Engineering Department, University of Michigan, Ann Arbor, Mich. Chas. E. Lucke, Professor of Mechanical Engineering, Columbia University, New York City. James A. Moyer, Professor in Charge of Department of Mechanical Engineering, Pennsylvania State College, State College, Pa. H. F. Thomson, Secretary Research Division, Electric Engineering Department, Massachusetts Institute of Technology, Boston, Mass. C. B. Veal, Professor of Machine Design, Purdue University, LaFayette, Ind.

Seamless Steel Tubes Division

H. W. Alden, Chairman, Chief Engineer, Timken-Detroit Axle Co., Detroit, Mich. H. L. Barton, Assistant Director of Production, General Motors Co., Detroit, Mich. J. J. Dunn, General Superintedent, Shelby Steel Tube Co., Pittsburgh, Pa.

Springs Division

Harold L. Pope, Chairman, Mechanical Engineer, Pope Mfg. Co., Hartford, Conn. Ralph L. Morgan, Consulting Engineer, 452 Main St., Worcester, Mass. W. N. Newkirk, Mechanical Engineer, William & Harvey Rowland, Inc., Philadelphia, Pa. Mason R. Rumney, Factory Manager, Detroit Steel Products Co., Detroit, Mich. A. C. Schulz, Assistant Engineer, Locomobile Co. of America, Bridgeport, Conn. C. E. Clemens, Mechanical Engineer, Perfection Spring Co., Cleveland, O. C. E. Reddig, Assistant Chief Engineer, Timken Detroit Axle Co., Detroit, Mich. C. W. McKinley, Chief Engineer, Willys-Overland Co., Toledo, O.

Truck Standards Division

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Spring and Axle Equipment

E. R. Whitney, Chairman, Chief Engineer, Commercial Truck Co. of America, Philadelphia, Pa. B. B. Bachman, Assistant Engineer, the Autocar Co. Ardmore, Pa. A. H. Ehle, Manager Electric Compressed Air Department, Baldwin Locomotive Works, Philadelphia, Pa.

Power Plant Equipment

W. A. Frederick, Chairman, Chief Engineer, Continental Motor Mfg. Co., Detroit, Mich. H. D. Church, Truck Engineer, Packard Motor Car Co., Detroit, Mich. C. T. Myers, Mechanical Engineer, 202 Scherer Bldg., Detroit, Mich.

Auxiliary Equipment

C. T. Myers, Chairman, Mechanical Engineer, 202 Scherer Bldg., Detroit, Mich. H. D. Church, Truck Engineer, Packard Motor Car Co., Detroit, Mich. W. A. Frederick, Chief Engineer, Continental Motor Mfg. Co., Detroit, Mich.

S.A.E. Has Sixty Standard Specifications

Standardization Has Reduced Manufacturing Cost and Saves Time in Delivery of Material—Standards Kept Up to Date—Committee Members are Specialists

WITH more than sixty vital sets of specifications already in the hands of automobile designers and engineers, the standards committee of the Society of Automobile Engineers has fairly launched itself on a campaign which is doing more to cut the cost of automobiles and to bring them within reach of the average consumer than any other known work. It is impossible to tell in terms of dollars and cents what the work of the committee has saved for the automobile manufacturers who have made use of these standards, but that the work is appreciated is easily perceived from the willingness of every company in the industry to foster the work of standardization and to lend aid to the committee.

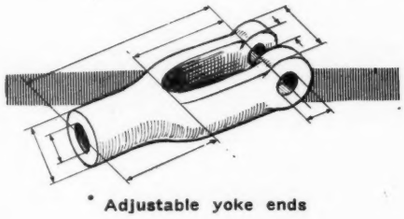
Standardization work has been carried out in making up sets of specifications of parts and materials. In the specifications for parts and accessories dimensions have been standardized so that it is possible for a manufacturer of a car to go to any maker of the standardized part or accessory and order a given part to be according to S. A. E. standard and he will know that he is getting what he requires. The same is true of metals. If steel is ordered to S. A. E. standards the user of that steel is assured of a uniform quality of metal. It saves time in the purchasing department for it is much easier to simply specify S. A. E. standard stock than it is to go into the lengthy description which would otherwise be necessary, and furthermore it saves time in delivery because it is quicker to obtain a metal of standard specifications than one of special composition.

The standards are always kept up to date. The committee is a standing one and as fast as the methods in use are replaced by others which would necessitate a change in the standards the old standards are abolished and new ones substituted. The adoption of these standards therefore in no way retards the normal progress of automobile manufacture. The combination of research work and investigation which continually occupies the members of the standards committee on the other hand does much to promote actual advancement in the selection of dimensions and material. It virtually means the concentration of specialized engineers on the subjects of standardization.

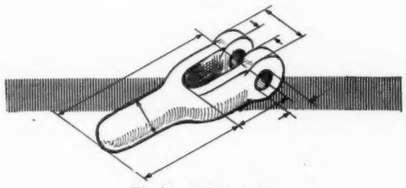
Yoke and Eye Rod Ends

In June of 1911 a set of standards for yoke and eye rod ends was adopted. Two types of yoke ends and the eye rod which passes between the horns of the yoke were standardized. The two types of yoke ends accepted by the society are the adjustable and the plain.

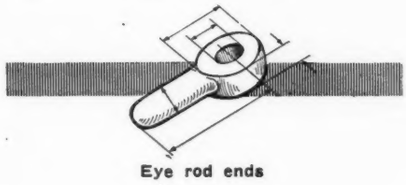
The adjustable type of yoke end is used by automobile manufacturers who desire to have the brake adjustment at the yoke. Eight sets of dimensions have been determined upon by the S. A. E. in settling upon a standard adjustable yoke end. Six sizes of yoke end are recognized in the adjustable form having a spread between the yoke from 3-16 inch up to 9-16 inch and a depth of clevis from 1 inch up to 1 7-8 inches. The dimensions which have been standardized are those shown on the accompanying illustration. They are the length of the yoke end from the root to the center of the clevis pin hole, the diameter of the root of the yoke end, the length of the part which fits on the end of the rod, the thread which fits the threaded end of the rod, the length of the clevis, the spread of the clevis and the total width of the clevis. The diameter of the pin hole is standardized and the committee is at the present time working on a standard pin. This work is in charge of the miscellaneous division.



Adjustable yoke ends



Plain yoke ends



Eye rod ends

Plain Yoke Ends

Under plain yoke ends where no screw thread adjustment feature is provided the standards committee has settled upon seven dimensions. These dimensions were accepted by the Society at the meeting held June, 1911. The dimensions which are now standard are those shown in the drawing herewith. The length is given between the center line of the clevis pin hole and the end of the root. The depth of the clevis is given between the center line of the clevis pin hole and the bottom of the curve on the inside of the clevis. The length of the root is given between the center of the circle at the bottom of the clevis and the end of the root.

Eye Rod Ends

The eye rod end which fits between the jaws of the clevis in making up the linkage has also been standardized. This fitting has been given five dimensions fixing it for length, thickness at the rod, thickness at the eye, diameter of eye and diameter of hole for clevis pin. Six sizes of eye rod ends are recognized by the S. A. E. and these correspond to the six sizes of adjustable or plain yoke end, thus giving a complete set of specifications that have been standardized for the assembly of the rod and yoke with the exception of the clevis pin and this is now under way in charge of the miscellaneous division of the standards committee.

S. A. E. Spark Plug Shell

One of the most annoying features that bothered the motorist of early days was the difficulty in securing spark plugs to fit the cylinders of his car. If he did not happen to have a spare plug with him he stood a small chance of picking up a plug that fitted accurately in any of the accessory shops. The S. A. E. has come to the rescue

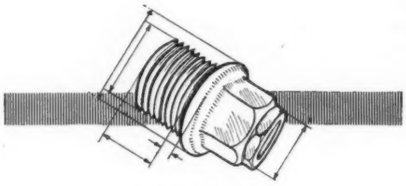
and has adopted a standard spark plug shell. On this shell seven dimensions are fixed and specifications for the construction and stock used are given in the same number. The S. A. E. plug has a .875-inch diameter, straight thread, 18 pitch and is fixed in the dimensions shown in the accompanying drawing. The outside diameter of the flange is 1.125 inches, the diameter of the nut is .875 inch, the thickness of the flange is .125 inch, the outside diameter of the thread .875 inch with an allowance from precise measurement of thread diameter of plus 0 and minus .003. The length of the threaded portion measured from the flange to the end must be at least 1-2 inch and the depth of the recess below the flange must not be more than .125 inch. The inside diameter is .75 inch. In addition to these dimensions the specifications for the stock to be used, the form of the head, the form of the flange, etc., are also furnished.

S. A. E. Screw Standard

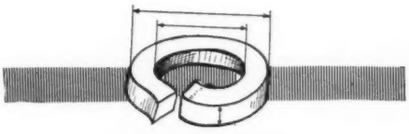
The fact that automobile manufacturers found it necessary from almost the inception of the industry to cut special screws, nuts, bolts, etc., with a finer thread than that given by the U. S. Standard led the technical branch of the A. L. A. M. to take up the work of standardizing a suitable thread. This work has been taken up by the S. A. E. with the result of adopting a standard set of screw specifications. These threads are rapidly being adopted by automobile manufacturers and have done much to relieve the difficulties formerly experienced in securing special taps, dies, gauges, etc. The screws and nuts made according to S. A. E. specifications are steel and it is required that the screws be left soft, screw heads soft, plain nuts soft, and castle nuts case hardened. It is assumed that where screws are to be used in soft material such as cast iron, brass, bronze or aluminum, the U. S. standard pitches will be used. The body diameters of the screws are .001 inch less than the nominal diameter with a plus tolerance of 0 and a minus tolerance of .002 inch. The nuts are required to be a good fit without perceptible shake. The tap used in cutting the thread must be between .002 inch and .003 inch over size. The sizes of taps and drills corresponding is given from the one-quarter inch by 28 threads up to 1.5 inches by 12 threads.

S. A. E. Lock Washer Standards

In cutting down the large assortment of ill-fitting and non-uniform lock washers the S. A. E. adopted in June, 1911, a set of specifications for lock washers. Two grades of lock washers known respectively as automobile heavy and automobile light have been adopted. In the heavy grade sixteen sizes from 3-16 inch up to 1.5 inches have been settled upon corresponding to bolt diameter of these sizes. In the light grade lock washer sections have been standardized from the 3-16 inch bolt diameter up to 1 inch. In standardizing the lock washer the width and depth have been given a fixed dimension and the inside diameter has been fixed at from 1-64 inch to 1-32 inch larger than the bolt diameter. All lock washers



Spark plug shell



Split lock washer

are required to have parallel faced sections and the outside diameters practically coincide with the long diameters of the S. A. E. standard nuts. The lock washers are required to stand a temper test in which after compression to flat the reaction shall be sufficient to indicate necessary spring power, and on a second compression no appreciable loss in reaction shall be apparent. A toughness test in which the washer is secured in a vise and twisted through 45 degrees without signs of fracture is also required.

S. A. E. Broaches and Splines

A set of standards has been adopted for shaft and collar fittings by the broaches division of the standardization committee. Four styles of fittings have been standardized. These are the square broach, the taper, six spline and ten spline.

In the square broach fitting, two sets of dimensions have been required. One set is for a permanent fit and the other for a sliding fit. The standards cover nominal shaft diameters of from .25 inch up to 4 inches. The dimensions of the broached hole and the shaft are all covered in the standards specifications and in the tabulation adopted by the Society, the full set of plus and minus tolerances is given for each dimension.

In the taper fitting used in connecting a gear to a shaft, for instance, the society has adopted a useful standard. The sets of specifications cover shafts of nominal diameter of from .25 inch up to 4 inches. The actual diameter of the shaft is given a plus and minus limit in which the plus limit is zero as far as the 7-8-inch shaft, .001 up to the 2-inch shaft and .002 up to the 4-inch shaft. The minus limit is .001 up to the 2-inch size and .002 from the 2-inch to the 4-inch sizes. For each size of shaft, thirteen dimensions are given to which the standard taper fitting must be held. These dimensions cover the shaft, the shaft hole, the length of the tapered portion, the length of the threaded part, the key way, the key and the cotter pin hole at the end of the shaft. The nut which screws on the end of the shaft and locks the fitting is also considered a part of the assembly and is fixed by the standard dimensions.

In the six-spline fittings three kinds of fit are recognized and fixed by standard dimensions of the shaft and the collar. These three types of fit are known as a permanent fit, a fit to slide when not under load and a fit to slide when under load. A separate tabulation of dimension is given to suit the requirements of each of the three fits. The dimensions required for each nominal shaft diameter are four in number. They are the actual diameter of the shaft, the diameter at the root of the spline, the width of the spline and a constant known as "t" which is made up of a formula to equal the inch-pounds torque capacity per inch bearing length at 1000 pounds pressure per square inch on the sides of the spline. No allowance is made for radii on corners nor for clearances.

The same method has been pursued in standardizing the ten-spline fitting as in the six spline. The same three grades of fit are required and the same number of dimensions as in the six-spline fitting; the specifications cover all nominal shaft diameters from .75 inch up to 3 inches.

Wheel Dimensions for Solid Tires

At the summer meeting held last year during the Great Lakes cruise, one of the most important standards to be adopted was incorporated in the fourth report of the commercial power wheel division. For both demountable and non-demountable rims in the single and dual tires a standard width of felloe and band has been adopted. In the single tire the width of the felloe and band must be .75 inch less than the sectional size of the tire, and in the dual tire of the felloe and band is twice the sectional size of tire. For the single tires the thickness of the steel band is .25 inch up to the 4.5-inch tire size and .375-inch on the 4.5-inch and larger sizes. For the dual tire the thickness of the steel band is .375 inch for all sizes of tires. The S. A. E. has also fixed on the sectional size of tire to be used in connection with each minimum felloe thickness. For instance,

on a tire of 5 inches sectional size a minimum felloe thickness of 2 inches is required.

In the making of the wheel a standard has been set beyond which the maker must not go in his deviation from precision in the felloe bands. These tolerances cover the circumference of the band before and after application to the wheel, width and thickness of band and radius after application.

Another point which has been standardized on commercial car wheels is the bolt equipment for side flanges. The wheel maker knows in following these standards the diameter of the bolt hole circle and the number of bolts for each diameter of tire from 26 up to 40 inches.

The felloe band itself is covered by standards which determine the formation of the edges. The S. A. E. requires the band to be rounded on the two outside edges with radius not to exceed 1-16 inch and one inside edge to have an angle of about 45 degrees extending about 1-16 inch from the edge. In measuring the circumference of the felloe band a correction amounting to three times the thickness of the tape line should be made.

In January, 1914, the society voted to standardize the 32, 36 and 40-inch commercial car wheel and the 16 and 20-inch wheel for industrial trucks.

S. A. E. Standard Bands and Strips

In order to get away from the large number of steel bands, band-edged flats and hoops for strips the standards committee through the sheet metal division provided a set of widths and gauges for rolling. The widths start at .375 inch and run up to 9.625 inches. The thicknesses for these widths of sheet are specified. In case strips of greater width than this are required the majority of the mills roll strips as wide as 20 inches in the heavier gauges. The gauge given in the standards is the well-known Birmingham wire gauge.

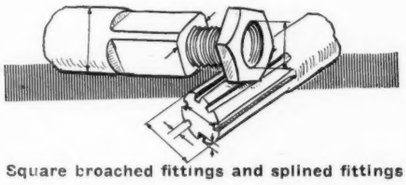
Non-Ferrous Metal Tubing

The Society has adopted specifications on non-ferrous tubing in all available sizes. This tubing is furnished in copper and the alloys of copper and zinc, such as high brass, bronze, phosphor bronze and tobin bronze. The exact composition and the temper of the tubing must be made to suit the requirements of the work for which it is intended and this part of the tube order is left up to the designing engineer. What the S. A. E. has standardized are the limitations of the outside and inside diameters of the tubing and the thickness of the tube wall.

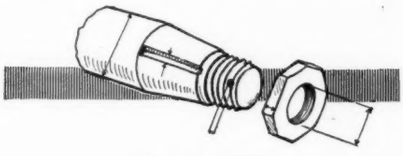
In holding tube makers to the S. A. E. limitations the Society has required that on tubing up to the 1-2-inch size the variation from the specified inside or outside diameter shall not be more than .002 inch over or under. The tolerance increases uniformly up to the 2-inch size at which point it shall not be more than .005 inch over or under and above the 2-inch size it cannot be more than .25 of 1 per cent. over or under. It is further specified that no combination of variations on the same tube shall make the thickness of the wall vary from the nominal by more than .001 inch up to the 1-64 inch thickness. The allowed variation on other wall thicknesses up to 3-8 inch has been specified and in the latter thickness must not vary more than .015 inch over or under. Where the manufacturer requires closer limits than these the society provides that he must so specify in his order.

Ball and Roller Bearing Sizes

In standardizing the sizes and tolerances on annular ball bearings the S. A. E. has divided and classified this type of bearing into three series, namely: light, medium and heavy. Each bearing has been given a standard number by means of which it can be ordered and which number includes a full set of bearing specifications. Five features of the bearing have been standardized. They are the bore, the diameter, width, corners of the outer race and inner race and eccentricity. In giving the size of the bore the standardization table gives the size in millimeters and inches and then gives the plus or minus tolerance over the bore. For instance, a number 202 light series bearing would have a bore of 15 millimeters or .59055 inch and will have a



Square broached fittings and splined fittings



Taper fittings

plus tolerance of .0002 inch or a minus tolerance of .0004 inch, thus the bearing could have a bore as low as .59035 inch or as high as .59095 inch.

The same line of information is given as standard in regard to the diameter of the bearing as in its bore. The outside diameter is given in millimeters and inches and then the plus and minus tolerances, but, since the bearing must fit exactly in the space provided for it, we find that the S. A. E. does not permit any plus tolerance in either the light, medium or heavy series. The plus tolerance in other words being zero. The minus tolerance therefore is somewhat larger for the diameter than it is for the bore. If we again take bearing 202 as an example its diameter is 35 millimeters or 1.37795 inches. Its plus tolerance over this dimension is zero and its minus tolerance is .0006 inch.

The width of the annular ball bearing is given in millimeters and inches and the plus and minus tolerance for both races is specified. The plus limit in the width in all three series is zero and the minus limit for all series and all sizes is .002 inch. Again taking bearing 202 as an example, the width is given as 11 millimeters or .43307 inch. The plus tolerance zero and the minus tolerance .002 inch.

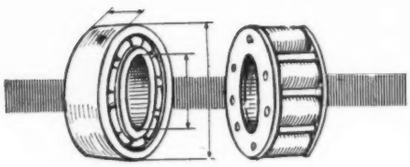
In specifying the corners of the outer race and at the bore of the inner race the width of the corner for each bearing size is given in millimeters and inches and the S. A. E. recommends that the corner be a chamfer of 45 degrees ground true with the bore and outside diameter. The amount of eccentricity allowed on each annular ball bearing in both the inner race and outer race is given in parts of an inch. On the smallest size bearing No. 200 the eccentricity tolerance is .0008 inch on the inner race and on the largest bearing No. 420 heavy series the eccentricity tolerance on the inner race is .0012 inch.

In getting up these specifications on annular ball bearings the S. A. E. has taken the extreme tolerances as endorsed by ball bearing manufacturers and therefore in case greater accuracy is required than would be given by using the tolerances specified in the tabulation the company ordering the bearing must furnish the ball bearing maker with the tolerance he desires. For short type roller bearings the same set of specifications for bore and outside diameter as for the annular ball bearing are standard. The long type of ball or roller bearing has not as yet been standardized.

S. A. E. Carbureter and Magneto Dimensions

One of the first necessities to be recognized by the standards committee was that of adopting fixed dimensions for the flanges by which carbureters were attached to the motor and for the various fittings such as gasoline pipes, throttle levers, etc. The carbureter and the magneto were to be found on every motor regardless of make and it seems highly essential that these be standardized.

On the carbureter five fittings have



Ball and roller bearings

shown themselves susceptible of standardization and at the June meeting of 1912 the flanges, pipe sizes, throttle levers, unions and ells and tees were given a set of fixed dimensions.

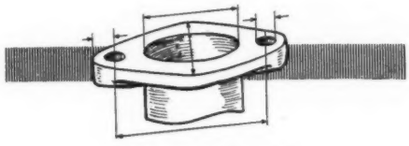
The S. A. E. recognizes seven sizes of carbureter. The smallest is the 3-4-inch and the largest 2-inch. In fixing on the dimensions or the flanges of these carbureters it was found necessary to standardize seven points. These are the opening which the gases pass through into the manifold, diameter of the bolt hole, the width of the flange, the distance between the bolt holes, the radius of the circle forming the ends of the flange, the thickness at the sides of the flange and the thickness at the ends. The threads in the bolt holes are U. S. Standard.

The gasoline pipe size to be used with each carbureter size is given and the Briggs standard pipe thread is used in connecting the pipe to the carbureter. For carbureters up to the 1-inch size, 1-8-inch pipe thread is used and up to the 2-inch size a 1-4-inch thread, throttle levers are required to be of 3-16-inch rod end for carbureters up to 1 inch and 1-4 inch rod end for the large sizes. The levers are of elliptical section having a rounded section at the eye .375 inch in diameter with a 3-16-inch hole in the center and a thickness of 3-16 inch at the eye, for carbureters up to the 1-inch size, and for the larger sizes these dimensions are respectively .5, .25, and 9-32 inch.

One of the sets of standards that were eagerly sought by car manufacturers were those which covered the tube fittings such as the flared tube unions and the flared tube ells and tees. In standardizing the flared union it was necessary to give dimensions of twelve parts. The pipe diameter is given in five sizes and the necessary bore dimensions and threads are given for each of the five pipe sizes. In the ells and tees the same five pipe sizes are recognized and ten dimensions are furnished for each.

The car manufacturer must use the standard magneto support if he desires interchangeability to be a feature of his car. The S. A. E. has adopted a set of sixteen magneto specifications for four- and six-cylinder engines. These are the shaft height, the distance from center of the front base-plate holes to large end of shaft taper, distance from center of front base-plate holes to center of rear base-plate holes, distance between centers of base-plate holes left to right, large diameter of taper, small diameter of taper and length of taper. Height of magneto space, length of magneto space, width of magneto space, plain hole in timing lever, tapped hole in timing lever. base-plate holes, thread for end of magneto shaft, length of thread and advance lever radius.

All the magneto dimensions are given in millimeters and in inches. These dimensions were standardized at the meeting of the Society held in January, 1912, and were revised under the third report of the miscellaneous division of the standards committee and adopted in their final form at the meeting of the Society held in January, 1913. By the use of the dimensions it is possible to transfer a magneto from one car to another. These dimensions are also assuming considerable importance in connection with the fitting of electric generators because many of



Carbureter flanges

them are built to be fitted on the same size platform as is the standard magneto.

Standard Motor Driven Air Pumps

With the rapidly increasing custom of the automobile manufacturers to fit a mechanical air pump as part of the standard equipment of the car the standards committee saw the necessity of adopting dimensions for the single and multi-cylinder air pump. Part of the fourth report of the miscellaneous division incorporated a set of dimensions for mechanically driven air pumps for motor cars and this part was accepted at the January, 1914, meeting of the Society. Eight dimensions were necessary to fix the standard specifications for the pumps. These covered the shaft height, shaft diameter, width of base, length of base, distance from center of front base plate holes to shoulder of shaft, distance between centers of base plate holes, both at right angles and parallel to shaft, the thread in the base plate hole and the dowels. This fixes the design for single cylinder as well as two- and four-cylindered air pumps.

Standard Lamps and Bases

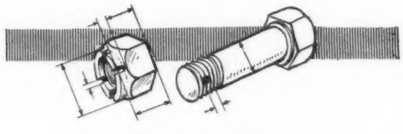
At the June meeting of 1912 a set of dimensions for incandescent lamp and the standard Ediswan lamp base were reported by the standards committee and accepted by the society. The Ediswan or Bayonet socket which was largely used in connection with the 6-volt lighting system was adopted as standard, and at the same time a set of maximum candlepower for head, side and tail lamps was also accepted. The head lamp was to have a maximum candlepower of 20 and the other lamps of 4 candlepower. In January, 1913, the electric lighting division of the standards committee reported for the 7-volt bulb specified to have an efficiency of 1.1 watts per candle at a voltage of between 6.5 and 7. This report was accepted by the Society and it was further accepted that the bulbs used in the headlights should be 2 1-16 inches in diameter and be capable of being focused in a reflector of 7-8 inch or greater focal length. The bulbs for side and rear lamps were required to be 1 inch in diameter and lamp makers were requested to fasten a label on all reflectors specifying the voltage, size and candlepower of the bulb to be used.

Regrinding Worn Cylinders

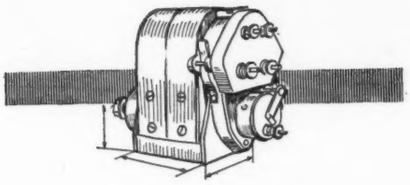
One of the few steps that the S. A. E. has taken in the repair field is in adopting a set of standards for oversized cylinders. This was adopted at the January, 1912, meeting of the Society as a result of a report from the miscellaneous division of the Standards Committee. It has been the custom in making repairs to regrind the cylinders until just sufficient metal is taken off to get below the scores or worn part in the cylinder. The result was that it was difficult to secure pistons of correct oversized dimensions to fit the reground cylinder. In order to obviate this, the society adopted four standards of oversize. The first being .01 inch large, the second .02, the third .03 and the fourth .04.

Instructions for Storage Battery Care

The bewilderment of the car owner when suddenly placed in charge of an electric system including a delicate storage battery, caused the Society to come to his rescue with a set of standard instructions for the care of this part of the system. As a result of deliberations on the part of the electrical equipment division, the Society adopted a set of nine standard rules. Each of these rules is followed by a series of explanatory paragraphs which renders the rules easily understood and simple to follow. The first of these rules applies to the car measure. It is that the battery must be properly installed, that is rigidly and securely fastened in



Screws and nuts



Magneto dimensions

place in such a manner that it is accessible to facilitate the matter of its care.

The second rule of keeping the battery and interior of the battery compartment quite clean and dry, applies to the owner as also do the other rules which tell him how the solution can be kept in its proper condition, how it should be charged and in what condition it must be left when it has to stand idle for some length of time.

The electrical equipment division has also done some valuable work on the insulation requirements of electrical apparatus after installation, the dimensions of lead batteries for lighting and for combined lighting and starting service, rating of lead batteries, and standard fuse dimensions.

The Society requires that electrical apparatus for use on gasoline automobiles, when operated on circuits of from 6 to 25 volts, shall be capable after installation of withstanding for 1 minute an alternating potential of 500 volts, the test being applied between the conducting circuit and frame or ground. In the case of apparatus with one terminal grounded, the ground connection shall be removed at such a point as will permit the test being applied to all parts of the circuit which, in actual use, will be subjected to working potential.

In order that uniform facilities for attaching the storage battery to the chassis can be provided by every car manufacturer it has been decided that the overall width of the battery measured from side to side shall not exceed 7.5 inches, the height from bottom of case to top shall not exceed 9.5 inches and the length of the battery may vary. The handles must be placed at the ends of the batteries and provisions for holding down devices shall be in the direction of the length of the battery and not in the direction of its width. The terminals and connections must not extend above the handles of the battery as the latter are required to be the highest point.

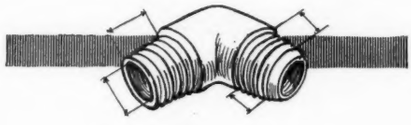
In rating lead batteries for lighting they are rated at the capacity of ampere-hours of the battery when discharge continuously at a 5-ampere rate to a final voltage of 1.8 per cell, the temperature at the beginning of the charge being 80 degrees Fahrenheit. In rating batteries for combined lighting and starting they are required to have two ratings, the first of which is the same as that given for lighting alone, and the second rating shall indicate starting ability and shall be the rate in amperes at which the battery will discharge for 20 minutes continuously to a final voltage of not less than 1.65 per cell. The temperature of the battery beginning such discharge to be 80 deg. Fahrenheit.

Another standard which has been put through by the electrical equipment division and which was accepted by the Society at the January, 1914, meeting is a set of standards, fuse dimensions, for use on circuits of 25 volts or less and 30 amperes or less. The Society states that these fuses shall be of the inclosed type, have an overall length of 1.5 inches, a head width of 13-32 inch and a head length of 3-8 inch. The fuses are to be marked with their carrying capacity and words 25 volts.

Spring Standards Adopted

A standard nomenclature oi nine types of leaf spring assemblies has been adopted by the Society. These are a half elliptic, three-quarter elliptic, elliptic, three-quarter scroll elliptic, scroll elliptic, platform, three-quarter elliptic platform, and auxiliary.

In the actual standardization of the



Flared tube ells and tees

spring itself, the width of the spring leaf, size of the center bolt, the various types of leaf end, and the spring clip shank have all been determined. The standard spring leafs for passenger cars are five in number, progressing by quarters of an inch from 1.5 inches to 2.5 inches. For commercial cars, the standard leaf widths are seven in number, progressing by half inches from 2 inches up to 4.5 inches with one-quarter size at 2.25 inches.

Center bolt sizes with filister head are made from 1.25 to 2.5 inches for passenger cars, and 2 inches to 4.5 inches for commercial cars. The bolts have been standardized in three particulars, the width of the head, the depth of the head, and the diameter of the shank. The S. A. E. calls for .375 inch diameter nibs, and where two bolts are used, they must be .75 inch center to center. Rebound clips must be used on all springs and the threads must be to S. A. E. standard.

Fourteen types of lead points for springs are recognized by the S. A. E. Standard names have been given to each of these. Seven of these are in common use. They are the oval, round point, short front point, round end slot and bead, ribbed, square point-tapered and Diamond point.

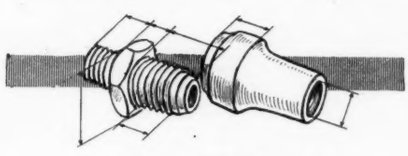
S. A. E. Standard of Material

The Society of Automobile Engineers has standardized thirteen general classes of metal. These general classes are in turn subdivided into metals for definite purposes. For instance, under the general head of steel, there are eleven subdivisions of steels of different characters and composition and seventeen kinds of heat treating which are suitable for the different steels specified. Again under the subdivisions there are different grades of steel of different compositions. For instance, under the head of carbon steel there are seven grades which vary with the carbon and manganese contents.

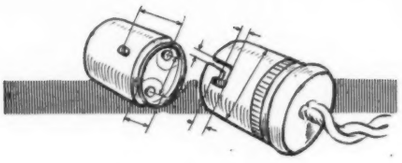
The iron and steel division of the standards committee is busily engaged at the present time in reducing the eighty specifications of S. A. E. steels to about half that number, and it is also in prospect that in some of the steels the previously accepted content of phosphorus and sulphur will be raised.

Two grades of valve metal, one which the Society says must not contain less than 9.6 per cent. nickel and which shall be malleable and the other which is a .50 carbon steel with 28 to 35 per cent. nickel have been standardized. In the line of babbitt metal, and the white brass and phosphor bronze, bearing metals the S. A. E. has adopted definite specifications. The same line of work has been carried out in the casting metals, red brass, yellow brass and manganese bronze. While definite specifications are given for the red and yellow brasses, the proportions in manganese bronze are of such an approximate character, the proportions being generally in the neighborhood of 60 parts copper to 40 of zinc, that the Society has given its specifications upon physical requirements. That is, a tensile strength of 60,000 pounds per square inch, a yield point of 30,000 pounds per square inch, and a 20 per cent. elongation of 2 inches.

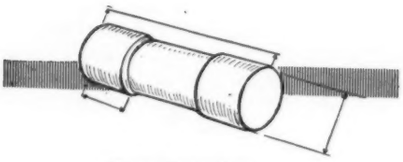
Manganese bronze for sheets and rods has been specified for the content of copper, tin, iron, manganese, lead and zinc. A set of temper numbers running from quarter hard up to spring temper has been given and limits of variation in thickness on cold rolled and hot rolled sheets and rods have also been given. The S. A. E. notes that manganese bronze is one of the



Flared tube unions



Ediswan lamp base



Fuse dimensions

strongest of the non-ferrous metals and can readily be worked both hot and cold. It has a tensile strength of from 70,000 to 72,000 pounds per square inch. The S. A. E. specifications for hard cast bronze and for gear bronze correspond respectively with U. S. Government bronze G and English gear bronze. The latter is used extensively abroad for worm drives.

Three Aluminum Alloys

S. A. E. specifications are given for three aluminum alloys. Two of these contain copper, and the other has none. The alloys are given numbers 1, 2 and 3, the first being 90 per cent. aluminum with 8.5 to 7 per cent. copper and is the lightest of the aluminums possessing a high degree of strength. Number 2 contains aluminum, zinc, copper and manganese and is for casting purposes where strength and closeness of grain are desirable. Number 3 contains only aluminum and zinc in proportions of 65 to 35 and is used for cheap casting.

Six grades of brass for sheets and strips have been standardized both as to composition and approximate physical properties. The S. A. E. gives the per cent. of copper, zinc, lead and iron in each class of brass sheet and also tells in both the hard and soft grades what the tensile strength and elongation should approximate. In addition to this permissible gauge variations are also printed for each width of strip. The same method of treatment has been given the brass rods, both the composition and physical properties being noted and in addition a list of diametrical variations for each size of rod. For tobin bronze rods just the physical properties are furnished.

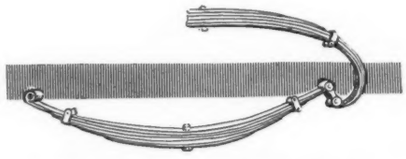
The S. A. E. furnishes a specification for a light lubricating oil for automobile engines. This specification requires that the oil be a pure mineral oil without the addition of any adulterant and it must have specific gravity of from 28 degrees to 32 degrees Baumé, flash point, not less than 400 degrees, fire test, not less than 450 degrees and a viscosity at 210 degrees Fahrenheit of 60 to 65 seconds on a Tagliabue viscosimeter. The carbon residue must not be over .50 per cent.

Committee Meetings Quarterly

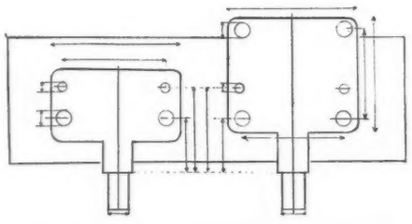
Until this year the meetings of the Standards Committee have been held semi-annually but now the meetings occur quarterly. The purpose of the new plan, is to make possible the broadening of the scope of the standardization work.

The last convention of the committee was held in the Society's offices in April and reports of progress in the many lines of work were made. These reports will come up at the present summer session for approval by the Council and then for formal discussion before the assembled engineers, after which they will be rejected or accepted by ballot.

The Springs division has been formulating a table of axle clips for use on pleasure cars, with the idea of reducing the number of sizes and submitting a design of clip that will represent the best engineering practice.



Three-quarter scroll elliptic spring



Dimensions for mechanically driven air pumps

The Iron and Steel division has been working on forms which can be used in securing data both in tabular and curve form, of the physical properties of the S. A. E. steels.

The date sheet division which has in charge the issuance of supplemental and superseding sheets for the S. A. E. handbook, has formulated recommendations as to the wide dissemination at a nominal cost of copies of S. A. E. practices.

It was decided by the Motor Testing division, at the last meeting, to draw up a code for use in connection with the conduct of motor tests.

The Nomenclature division, at the April meeting, voted that the council instruct the various divisions of the committee, to refer to it all questions on nomenclature.

The Broaches division has been working on a design for four spline shafting that will meet all requirements.

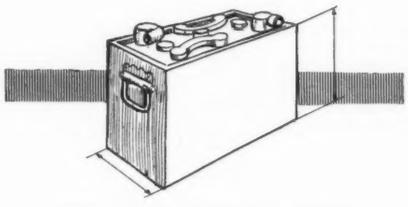
The present discussion as to four-spline practice is principally concerned with the division of the periphery. For equal division the arguments are that it is in conformity with the general design of six and ten-spline shafts, that in milling there is less material removed from the cutting surface, and therefore the cost is reduced, that in grinding there is less surface to be covered and that the shaft is stiffer.

However, in favor of unequal division it is set forth that there is a larger bearing surface on the small diameter—this is especially important when auxiliary grooves are provided at the root of the spline, that a lighter shaft is obtained, that there is less material to be removed by the broach and that other things being equal, a gear or other part, containing the broached hole would probably go out of shape in heat treating, somewhat less with narrow, than with the comparatively wide slots from an equal division of the periphery.

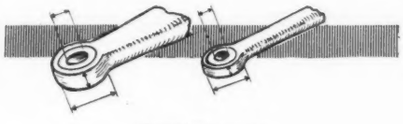
The Pleasure Car Wheels division expects to make recommendations which will reduce the commonly used sizes of pneumatic tires to twelve. At the present time some of the tire companies are listing over fifty.

The possibility of standardizing wood wheels and felloe bands was taken up at the last meeting of the committee. A number of drawings and sketches were submitted to elucidate the subject. The opinion was that it is feasible to recommend two sets of dimension which will cover the practice.

The Ball and Roller Bearings division has been wrestling with the task of reducing the number of sizes of stock roller bearings in the case of the so-called short sizes which are not interchangeable with the dimension which have already been accepted for ball bearings.

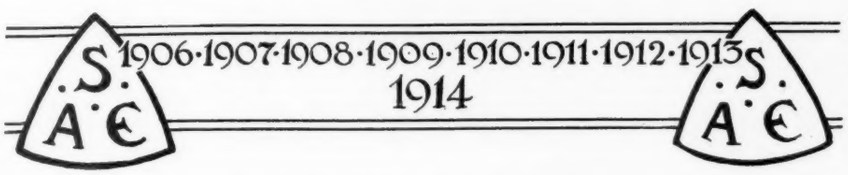


Dimensions for storage battery



Throttle levers

The Eight S. A. E. Summer Sessions



THE 1914 meeting at Cape May, N. J., marks the eighth summer session of the S. A. E. The first one was held in Buffalo in 1907, and a meeting has been held every summer since.

The inception of the summer meeting dates back to the first annual banquet of the society at the New Grand Hotel, New York City, Jan. 8, 1906. There was some discussion as to the advisability of holding a summer meeting in some city west of New York. Buffalo was favored by many members for this purpose and it was decided that the secretary, later on, should take a mail vote on the subject and so ascertain the wishes of the majority. It was not until the following year, however, that the first summer session convened.

It was held July 29 and 30, 1907, at Buffalo, N. Y. During this meeting the Pierce-Arrow and Thomas plants were inspected and six interesting papers were presented. Some Micro-Structural Considerations, by J. M. Ellsworth and T. J. Fay; Motor Vehicle Springs, by John G. Rumley; Points on the Equipment of the Hardening Room, by Joseph Schaeffers; Influence of Acids in Lubricating Oils on Bearings by Henry Hess; Timing Automobile Races, by A. L. McMurtry and the Carbureter and Its Functions, by Charles E. Duryea.

The Eight S. A. E. Summer Meeting Places

1914	Cape May, N. J.
1913	Detroit, Mich.
1912	Detroit, Mich.
1911	Dayton, O.
1910	Detroit, Mich.
1909	Chicago, Ill.
1908	Detroit, Mich.
1907	Buffalo, N. Y.

Good Meeting at Detroit

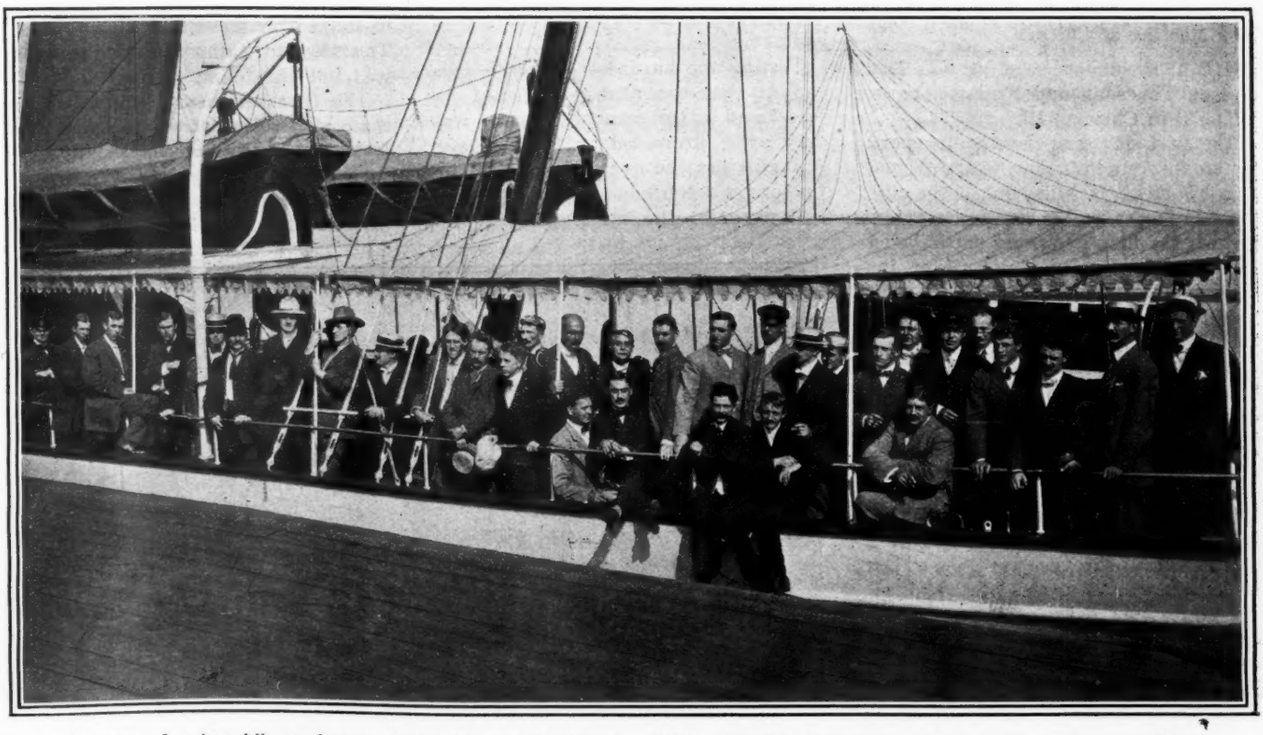
THE second annual summer meeting, which was held in Detroit, June 25 to 27, 1908, was by far the most successful gathering that the society had thus far experienced in its 3 years of existence.

The first thing on the program Thursday morning was a launching of a huge lake freighter and after this the automobile contingent was picked up in a number of cars tendered by the Chalmers and Packard factories, were taken to dinner and were given a long ride. Then the engineers were whisked across the city to the Ford plant, where a car was being turned out every 6 minutes.

In the evening, the first paper scheduled was one on autogenous welding, which was read by E. S. Foljambe. He described the apparatus necessary and the method of employing it for both welding and cutting, outlining in addition, a few of the many possibilities that this process held for the automobile, such as welding frames, and other parts and the repairing of broken parts, particularly aluminum and iron castings. Several drop-forged pieces, such as connecting-rods which had been cut in half for this purpose, were quickly joined.

Following this was a paper on the Storage Battery in Automobile Work, by Bruce Ford.

J. O. Heinze then read a paper entitled, Recent Developments in Magneto



A group of automobile engineers aboard the yacht Wingah, Detroit, 1906—the forerunner of S. A. E. summer meetings

Group of S. A. E. engineers on board City of Detroit on 1912 lake trip

Ignition which was warmly received.

Friday morning the automobile engineers attended the meeting of the American Society of Mechanical Engineers in order to hear a paper by Henry Souther on clutches.

Upon the conclusion of this session, the engineers were carried in a string of Cadillac cars to the plant where these cars are made. The most impressive feature of this plant was the thoroughly worked-out system of manufacturing.

The final session was held on Belle Isle. A paper on the Unit System of Power Transmission in Automobiles, by Frank Beemer, was read by Secretary Hayward. This was followed by A. L. Dixon's paper on the Increased Efficiency of the Single Motor Drive.

1909 Meeting at Chicago

THE 1909 summer meeting was held on Thursday and Friday, August 6 and 7, in Chicago, Ill.

The first day was devoted to sport, the engineers adjourning to the Algonquin hill-climb, 50 miles out of the city.

Friday morning the convention really opened, the first presented paper being entitled, The Commercial Test of the Pierce Water-Cooled Motor. It was read by Prof. R. C. Carpenter, of Cornell University.

An equally interesting paper was, Some Points in the Operation and the Care of Vehicle Batteries, by H. M. Beck; this paper included information about the ampere-hour meter which had just previously been introduced.

Frank H. Floyd read a short paper on Lubricating Oils, in which attention was drawn to the vast varieties of oil. He compared the crudes of the different states and drew attention to the qualities possessed by each one.

Secretary Alexander Churchward's paper on, Energy and Consumption of Commercial Vehicles, consisted of a vast amount of data on the loss of power due to tires, transmission losses, road resistance, grades, springs, using direct gear ratios, stops during the day and the methods of acceleration.

Mr. Churchward also read a paper prepared by H. S. Baldwin on the Electric Cradle Dynamometer.

300 Attend in 1910

FIVE years of painstaking effort on the part of the automobile engineers of this country reached a fitting culmination at the summer meeting which opened in Detroit on July 28, 1910, at the Hotel Tuller.

Over 300 enthusiastic members attended and as the program included ten papers covering extremely important subjects the amount of useful information thus disseminated broadcast throughout the industry can hardly be estimated.

Testing the hardness of metals is a subject that has always attracted interest and at this meeting a paper was very aptly presented by F. A. Shore. A feature of the paper was a description of the scelerscope.

A paper by the late Eugene P. Batzell entitled, Slide, Rotary and Piston Valves Versus Poppet Valves for Gas Engine Service was listened to with evident satisfaction and proved to be an excellent resumé of the work to date.

It was at this meeting that the first step was taken towards simplifying the nomenclature of the automobile art. F. E. Watt, at the request of President Coffin, fired the first gun by reading a paper on A Standard Automobile Nomenclature.

The patent situation which was just as acute then as it is now, was touched upon by E. J. Stoddard in a paper entitled, The Establishment of a Court of Patent Appeals. It brought out the important point that a law-abiding citizen finds himself unable to determine whether or not he is infringing on a patent when he makes a machine.

Descriptive of the advance made in the manufacture of gears, F. A. Ward presented a paper entitled, The Making of Gears Quiet by Grinding. The gear grinder described by Mr. Ward takes the gears after they are hardened and refashions the teeth so that any inaccuracy due to warping is eliminated.

The problem of standardization was given a boost in the right direction by D. F. Graham in a paper entitled, The Variation of Current Practice in Anti-Friction Metals.

Lawrence W. Whitcomb presented a paper on the economical side of shop upkeep.

Crowd to Dayton in 1911

THE year 1911 saw the S. A. E. engineers assembled in Dayton, O., in large numbers. From June 15 to 17, Thursday to Saturday, every moment was full of interest.

The first technical business was in the second report of the Iron and Steel division and the recommendations of the various committees were ratified.

Standard lock washer dimensions were adopted for bolts varying in diam-

Group of Society of Automobile Engineers and visiting

eter from 3-16 to 5-8 and specifications for this material were given. The seamless steel tube division recommended the adoption of standard cold-drawn seamless steel tube sizes.

The Thursday evening session was opened by W. P. Kennedy, by reading the report on wheel dimensions, and fastenings and tires and after this Mr. Kennedy read a paper entitled, Administrative Engineering and Salesmanship in the Commercial Car Field, which proved the feature of the meeting.

The next business session occurred on Saturday morning and the first question that came up was the adoption of carbureter standards, as outlined by the committee. It was suggested that the specifications should cover no carbureters over 2 inches. This was agreed to.

The subject of broaches was discussed by C. E. Davis, of the Warner Gear Co. For light shafts it was recommended that four splines be used, while for heavier ones, six splines were advised.

Magneto standardization was next considered, and then the springs division presented its report. Next came a report on the standard types of gear change quadrants.

Boat Trip in 1912

THE mid-summer meeting of 1912 was unique in that all business meetings were hold on board ship, the lake steamer, *City of Detroit*, having been chartered for the occasion. Starting Friday morning, a 2-day cruise from Detroit to Mackinac Island and return was indulged in.

The convention was called to order on Thursday morning, June 27 in the Convention Hall of the Hotel Ponchartrain.

The papers presented were: Motor Sizes and Drive Ratios for Commercial Vehicles, by E. P. Batzell; A Comprehensive Motor Test, by Herbert Chase; Standardization and Co-Operation in Motor Testing, by Herbert L. Connell and Worm Gears, by Frank Burgess.

S. A. E. and I. A. E. engineers at play on 1913 trip

The presentation of the reports of the various standard committees is always an important factor in regular sessions but time did not permit all the reports to be presented. The fourth report on standard carbureter fittings was accepted. It pertained to standardizing the size of the flanges on carbureters for attachment to intake manifolds. The report also covered the matter of uniformity in connection for the gasoline and water pipes to the carbureter.

I. A. E. Guests in 1913

AS in 1912, the 1913 summer meeting was held on Lake Huron, aboard the steamer *City of Detroit III*, June 4 to 7. The cruise was to the Soo, Mackinac Island and back, and the feature of the session was the visit of the British engineers, twenty-six attending.

The attendance was excellent, 569 passengers being carried, of whom about half were engineers.

Important developments took place at this session. Ten divisions were called upon for reports. Out of these, three submitted reports which were accepted, one on iron and steel with an amendment.

An important feature of the session was a resolution of the society against the Oldfield patent bill which was then pending before Congress. This bill menaced the rights of the holders of patents and in fact would do much to rob the inventor of the fruits of his labor.

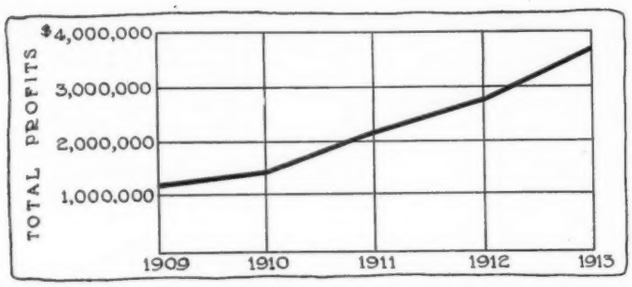
This resolution is of special interest at the present time because the Oldfield bill slightly changed, but just as objectionable, has been reintroduced within the past few weeks.

In the professional program the Britishers played an important part, offering four of the papers read. President Browne, of the I. A. E., told of the growth, development and construction of the gasoline omnibus in London: Thomas Clarkson, the leader in the manufacture of steam buses in London delineated their advantages and present-day status; Charles Wheeler, head of the motor transport department of the British postoffice department, spoke on calculating efficiency; and E. B. Wood, on the Measurement of Horsepower.

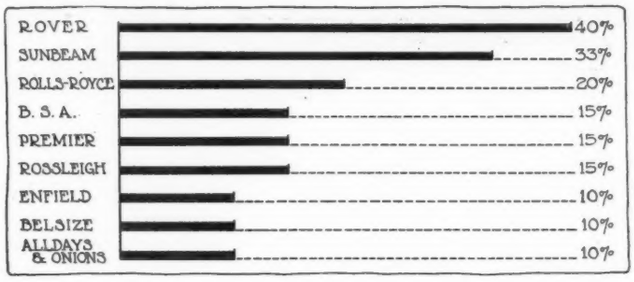
George W. Houk read a paper on Wire Wheels, drawing attention to their light weight and other advantages.

However, not all the time was spent in serious business, enough entertainment of varied character being furnished to make the meeting take on a holiday aspect. On Thursday night, on board ship, the British visitors, in long flowing robes, represented a group of inspectors sent to America to report on conditions in automobile factories. Among other things, they remarked upon the speed in the Ford plant. The following evening the Metropolitan Section rendered a one-act playlet entitled, Reverse English on the Heat Treatment.

Institution of Automobile Engineers from England



Total profits of fifteen leading English concerns from 1909 to date



Dividends declared by nine English car makers in 1913

English Makers' Gain $11,072,695 In 4 Years

Total Profits 51.9 Per Cent of the Entire Capital of $21,327,135 from 1909 to End of 1913—American Competition Being Felt

THE British automobile industry, as a whole, has been successful during the last 5 years as the statements of their annual financial condition indicates in the case of fifteen of the leading motor car manufacturers. With a total capitalization of $21,327,135, these concerns made a total profit of $11,072,695, or 51.9 per cent. of their capital, from 1909 to the end of 1913.

There are not many manufacturers who make automobiles exclusively and of the fifteen concerns referred to only five make motor cars only, the others are making, in addition, motorcycles, bicycles, parts and accessories.

Most Outputs Are 200 to 300 Cars

The majority of British manufacturers make 200 to 500 cars per year and the latter figure is even considered in the trade as meaning a great concern. Like the Continental automobile manufacturers the majority of the English makers have been cautious and have not invested much money into their business until the last 2 or 3 years. Several who did spend lavishly, who wanted to imitate the large American concerns 2 or 3 years ago, failed in their effort. Furthermore, the British idea has never been, until very recently, to build cheap cars, but since the American low-priced cars have been selling so well some British makers have come to the conclusion that they must also start to build low-priced cars if they want to keep alive.

In proportion to the number of cars he makes the British manufacturer has been among those who made the largest profits. Now, however, this is changing and there will be a difference in the balance sheets of the future.

Several important automobile manufacturers have become identified with other businesses or are being controlled by other corporations. The old Wolseley Tool & Motor Car Co., is now a part of Vickers, the shipbuilders. The British Daimler Works have been absorbed by the Birmingham Small Arms Co.

Great Britain's biggest automobile manufacturing concern, which also makes motorcycles, bicycles and parts, is the B. S. A., as the Birmingham Small Arms Co. is generally known. In business since 1896, this company has a capital stock of $7,500,000 or more than one-third the total capital stock of the leading fifteen concerns. Its profits have been proportionately large, totaling $3,910,275 for the last 5 years or 31.3 per cent. of the total profits of the fifteen concerns. The largest single year's profit was in 1911, when $1,164,090 was earned or 9.5 per cent. of the total profits of the fifteen concerns in 5 years.

Among the concerns which make only automobiles the Rolls-Royce, while not the largest in size, ranks as the leader. Starting only 8 years ago, this concern has always made only high-priced cars. Last year was the banner year when $440,910 was earned. In 5 years—1909 to 1913—the total profits were $1,310,075, the yearly average being $262,015.

The Rover company earned nearly two-thirds of its total profits for the last 5 years during 1913 when the profit was $588,120 and the shareholders received 40 per cent. dividend. The Rover success was due to its popular-priced car, a 12 horsepower four-cylinder, listed at $1,750 and of which the concern could not turn out enough to meet the demand.

Sunbeam's Rise Phenomenal

The growth of the Sunbeam company has been a matter of surprise in the trade and is due greatly to the success of these cars in races on the Continent. In 1909 the profits totaled only $450 and no dividend was paid. The following year ended with a profit of $103,500 or an increase of 23,000 per cent. over 1909. In 1911 the profits were almost 100 per cent. greater than those of the previous year, the total being $204,940. In 1912 the shareholders had $304,450 to divide among them and in 1913 the profits totaled $467,045 or 103,700 per cent. greater than they had been only 5 years ago. The average profit per year has been $216,077.

The Rudge-Whitworth concern is now again doing well, after 2 years, during which nearly $190,000 were lost. The Humber is in the same situation, having lost heavily in

Financial Standing of 15 Leading British Firms

Total capital stock	$21,327,135
Average capital per concern	1,421,809
Total profits	11,072,695
Average profit per concern	738,180
Proportion between profits and capital invested	51.9%
Total loss	789,350
Proportion of loss to capital	2.7%
Average loss per concern	52,620
Biggest total profits of one concern in 5 years—B. S. A.	3,910,275
Percentage, viz., total profits	28.1%
Largest total profit of exclusive automobile manufacturer—Rolls-Royce	1,310,075
Percentage, viz., total profits	8.4%
Biggest profit during one year of any one manufacturer—B. S. A.	1,164,090
Biggest profit during one year of an exclusive automobile manufacturer—Rover	588,120
Percentage of profits, viz., total profits of all manufacturers	18.8%
Largest loss of one concern in one year—Siddeley-Deasy	485,580

Total Yearly Profits of the Same 15 Concerns

1909	$1,136,240	1912	$2,707,990
1910	1,371,350	1913	3,629,325
1911	2,227,785		

1909. Then came two seasons during which its business did not grow much. It was only since the light medium-priced cars were started by the company that its business has again been growing and 1913 was the best year in its history.

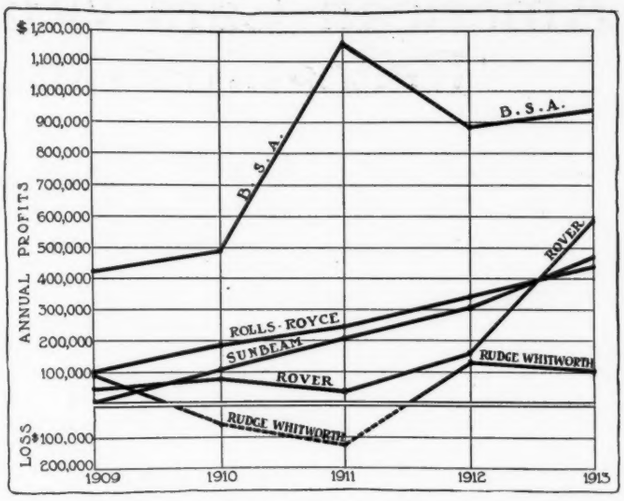
Until 2 years ago only a few of the British manufacturers would admit that American competition was actually becoming a most serious factor. Not that they feared about their high-priced cars but what they made and called medium-priced cars were actually very high-priced in comparison with the low-priced American cars.

De Dion Acknowledges American Competition

One of the first concerns in the United Kingdom which made reference to the new state of affairs in the automobile industry since the American car had become prominent, was the De Dion Bouton concern. For many years this was a prosperous company but in 1913 no dividend could be paid, and the chairman, when reporting about the year's business at the annual meeting of the stockholders, frankly admitted that the unsatisfactory business was due to the strong competition of the American cheap cars. The De Dion, which is rather a French-British concern, as its main factory is located in France, has been making a specialty of building low-priced cars, and, like the Darracq and Clement and other French concerns which are controlled by British capitalists and therefore considered erroneously as British concerns, its inability to manufacture cheaply enough has prevented it from competing successfully against the American cars.

A Britisher who has made a specialty in studying the condition of the automobile industry at home recently warned the manufacturers that they must realize existing conditions and be governed accordingly.

"The American car is a factor," said this authority, "which the British small car has got to face if it is to exist. Those British manufacturers who can sell the output of their factories make a high profit per car while the American makes a low one, competition between the American manufacturers at home being so keen as to have cut the margin of profit per car down to an almost nominal figure. The British manufacturer has been content to sell his moderate output at a good profit and meanwhile the Americans have got a footing and are rapidly building up a reputation that their cars, though cheap, possess some good qualities."



Showing fluctuation in profit and loss of five leading English car makers from 1909 to date

American Maker Has Won Good Will

"There is no doubt that the British manufacturer has allowed the American manufacturer to build up a valuable good will and in future the British maker will have to sell at low prices, by cutting down his profit per car and by lowering his cost of production.

"The Rolls-Royce is far above American competition for it has never attempted to fix its selling price with any regard as to what others might be doing. Its profits have continually expanded. The only doubtful point about its future is the possibility of the exhaustion of the market for its product. The number of purchasers of cars at $7,000 must be limited and very few indeed of these purchasers are likely to require a new car every year, as is common with users of $1,000 cars."

Profit or Loss of Fifteen Leading British Automobile Manufacturers

Concern	Location	Started	Capital	1909	1910	1911	1912	1913	Total	Average per Year
Rover	Coventry	1896	$1,000,000	5% $46,105	5% $74,195	5% $35,625	10% $159,150	40% $588,120	$903,195	$180,639
Rudge-Whitworth	Coventry	1894	1,000,000	10% 86,650	* 59,285	* 128,975	 125,495	 102,915	315,060	†63,012
B. S. A	Birmingham	1896	7,500,000	10% 420,430	10% 493,880	15% 1,164,090	15% 892,270	15% 939,605	3,910,275	782,055
Humber	Coventry	1900	3,250,000	* 115,510	 25,225	 22,215	 128,350	 250,455	426,245	‡85,249
Enfield	Redditch	1906	750,000	6% 79,750	5% 33,640	5% 36,500	5% 70,275	10% 119,065	339,230	67,846
Beleize	Manchester	1906	1,500,000	8% 66,440	10% 126,940	10% 133,870	10% 172,220	10% 177,000	676,470	135,294
Sunbeam	Wolverhampton	1905	1,000,000	 450	20% 103,500	20% 204,940	25% 304,450	33⅓% 467,045	1,080,385	216,077
Rolls-Royce	Derby	1906	1,000,000	15% 89,970	15% 180,315	15% 243,565	20% 345,315	20% 440,910	1,310,075	262,015
Alldays & Onions	Birmingham	1899	625,000	20% 143,825	10% 52,440	10% 58,540	10% 85,570	10% 92,180	432,555	86,511
Premier	Coventry	1891	875,000	7.5% 67,300	10% 131,560	10% 137,390	15% 135,360	15% 130,145	601,755	120,351
Rossleigh	Edinburgh	1896	178,125	6% 23,165	15% 56,110	15% 39,790	15% 45,665	15% 62,580	227,310	45,462
Argyll	Alexandria	1905	1,049,010	 8,150	 14,705	 32,240	 17,610	 40,655	113,365	22,673
Siddeley-Deasy	Coventry	1906	325,000	 21,270	* 485,580	 10,005	8⅓% 68,200	8⅓% 72,730	172,205	‡34,441
New Hudson	Birmingham	1896	625,000	5% 15,390	5% 18,080	5% 25,360	10% 82,565	10% 70,910	212,305	42,461
Swift	Coventry	1896	1,000,000	 57,345	 60,760	 83,655	 75,495	 75,010	352,265	70,453
Total, 15 concerns		....	$21,327,135	$1,136,240	$1,371,350	$2,227,785	$2,707,990	$3,629,325	$11,072,695	$2,214,539
Average per concern		....	$1,421,809	$75,750	$91,423	$148,519	$180,533	$241,955	$738,180	$140,969

*—Loss. †—3 years. ‡—4 years.

American Cars Win Recognition in Europe

Russia Is the Great Field for Which the Automobile Makers of the World Are Battling—Conditions Good in Great Britain

DETROIT, MICH., June 20—"The American automobile is in a fair way of being recognized for its merits, and not only for its moderate price not only in Great Britain, where the largest number of U. S. made cars are to be found, but everywhere on the Continent," said J. L. Poole, resident European export manager of the Hupp Motor Car Co., who is spending the summer in America. "The time of the facturers and agents is passing. The knocking policy of the European manupeople have heard so much said against the American cars that they have become interested in them and they have found that instead of meriting to be knocked our American cars ought to be boosted, for while they are low-priced there is nothing hardly to be found in Europe that compares with them, unless it be in the high-priced cars.

Business in Europe Bad

"The automobile business in general has not been good in Europe this year. In Germany especially the business has been very bad. One of the principal reasons or causes is the big war fund which Germany is raising, and which, according to statements made to me, means some $200,000,000, which the German people must contribute. And of course the automobile industry, which is still considered by many as an industry de luxe, suffers very heavily. Another cause is the general financial condition of Germany, which has not been the best since the Balkan war.

Many Strikes in Italy

"In Italy the conditions of the automobile trade are bad. There have been strikes in the metal industries in the large cities and many of the large plants where motor cars are made have not been in operation regularly. But the principal reason is the high tax levied upon motor cars. Unlike in other countries, where the high-priced automobiles are subject to the highest taxes, in Italy it is the lowest-priced cars which must pay the highest taxes. This is done to prevent the importation of low-priced cars, because they do not make any in Italy and thus they favor the home industry.

"In Belgium the business is almost being ruined through new high taxes. The Belgian Automobile Club and the Belgian Automobile Manufacturers' Association are doing all they can to have the government realize that it is doing a great injury to the industry, but the government does not seem to favor the motor industry or the motorist and it is likely that the high taxes will stand.

"In Great Britain the business has been very good, but owing to the Ulster troubles, the automobile trade in Ireland has been injured. In Austria and Hungary business is only fair and this is due to the aftermath of the Balkan war. This war has caused an immense loss in all that part of Europe and the automobile business in those countries, which was so promising before the war, is now very dull. In time it will again become better as there is a good market for cars there.

"In Russia competition is very hard. Russia is the great automobile center of the future in Europe. That is where the Germans, the Frenchmen, the Englishmen and all others who make motor cars are now making their biggest efforts to gain a strong standing. The Russian business is unlimited. No one here can guess at how many cars could be sold, how many people there are that have the means to buy a car. It is a rich country and, once its road system is properly organized, when good roads have become a fact, then the automobile business will make giant strides. The roads in Russia are among the worst in the world. In St. Petersburg, Moscow and Odessa, there are some asphalt pavements, but in general in cities and towns there are rough stone or granite block roads, or streets, while in the country one often does not know whether one is on a road or just in the open country. One thing is certain, Russia is a fine testing place for any car, for if you go over those Russian roads without trouble you surely ought to be able to go through the rest of Europe.

Trade Good in France

"Our business has been very good in France, especially since the French Hupmobile company started its credit system, whereby our cars are sold on monthly payments. This has been an incentive to many buyers who have good incomes, but who for various reasons prefer to purchase a car in this manner. Some cars which we sold this year will not be fully paid for until 1916. Furthermore we give the customer the privilege of exchanging his car, at any time he wants, for a new one, the only condition being that he pay a certain sum determined by the number of months the car has been used. The customer in that way has the guarantee of having at any time and at little expense a car equipped with all the new improvements."

After spending the summer in the United States, Mr. Poole will again sail for Europe to look after the Hupmobile interests in Berlin, London, Paris, Brussels, etc.

The Best Automobile Upholstery Leather Comes from France —Outside Layer of Hide Wears Longest

THE leather that goes into the trimming of an automobile is a feature that very few people appreciate. An automobile that is trimmed in poor leather will have shabby seats in 6 months and will fall in the estimation of the owner regardless of how well the car might stand up in other respects.

The best leather for trimming comes from France. The value of leather for trimming is determined largely by uniformity of size of the hides and lack of flankiness. The cattle in France are sleek and well-kept and hence there is little flank. And hides are more uniform in size.

The cheapest leather comes from South America. Cattle there are utilized chiefly for their hides and for beef extract. But the cattle run wild and hence are more rangy and the hides run to flanks. The hides from American cattle class next to those from France.

After the hide is removed from the animal it is given a treatment that causes it to swell. Then it is split into three, and sometimes four, layers. The layer next to the hair is the best because it is the weather-side, provided by nature for the protection of the animal. This layer also has the natural grain. The lower layer, the one next to the flesh, is of the poorest quality. These lower layers are artificially grained to simulate the natural grain. It requires the eye, touch and experience of an expert to tell the difference.

Much skill is required in cutting up a hide for trimming. The toughest part, that of the back, is selected for the places that have the greatest wear. The hide of legs and flanks is put where there is minimum wear.

Truck Makers Find Business Improvement

May Sales of Federal and Republic Cos.' Vehicles Point to More Prosperous Times—Other Makers Complain of Mexican Situation

DETROIT, MICH., June 20—According to the statements made by the leading Detroit automobile truck dealers and manufacturers, business during the month of May and the beginning of June, although somewhat slack, has been generally satisfactory. Most of them think that, while the Mexican situation has something to do with the unsettled business conditions throughout the country, the internal political situation, or more plainly, the present administration, is causing all the troubles in the business world.

Compared with the business done during the same period in 1913 some manufacturers and dealers claim that this year's showing is much better, while others say it is just the contrary. As a matter of fact, May has never been a big business month.

Federal Sales Gain 25 per Cent.

The Federal Company, making the Federal trucks, stated that business had not only been very good but the best the concern ever had. Sales have increased 25 per cent. all over the country. The affairs of Mexico may have had some bearing on the business in a general way but do not seem to have affected the selling of Federal trucks.

A representative of the Republic Motor Sales Co., which sells Republic trucks, stated that business has been better than last year. The demand has been especially for the smaller trucks of 1 and 1.5 tons. Inquiries and the calling of prospective buyers have been quite steady as in 1913 and it looks as if the next few months will show a big business.

"The motor truck business in Detroit has been rather dull in May," said R. L. Owen of the General Motors Truck Co., "but we are well satisfied as business in the outlying districts has been very satisfactory; in fact, our company sold more trucks in May than ever before in the history of the business.

"We recently received several large orders, one from the Indian Refining Co. for ten 2-ton and three 3.5-ton trucks, to be equipped with tanks for carrying gasoline and oil. The Murray Construction Co., of Knoxville, Tenn., placed an order with us for four 5-ton trucks equipped with automatic dump bodies for road construction work. During June we will deliver, on one order, twenty-five electric and gasoline trucks to the Loose-Wiles Biscuit Co., of Long Island City, N. Y.

"Judging from the inquiries and prospective buyers on our records, I see no reason why 1915 should not be the biggest year that the commercial truck trade has known. We still have 2 more months in our fiscal year—June and July—and the indications are that they will be at least as good as last year, which were record months with our company.

"There was a time, not far distant in the past, when the man in the country did not want to hear the words motor truck. You could not talk business to him as his mind had already been made up on the matter that the automobile for business purposes is more expensive than the horse-drawn vehicle. Gradually, however, the out-of-town business man or prospective truck buyer has found what motor trucks have been doing in the larger cities. The publicity given the commercial cars by the trade papers has been one of the best means of getting the business people in the country and in the cities interested in trucks and other commercial motor cars.

"The selling of automobile trucks no longer requires such hard work as years ago—it has come down to the point of showing just where there are dollars and cents to be saved by using motor trucks instead of horse-drawn vehicles; in fact, the prospective purchaser of a motor truck has already posted himself as to what a truck will do and it is principally a case of showing him that he not only saves time, is able to deliver his goods more rapidly, thus satisfying his customers, but that he covers much greater mileage than with horses and actually saves money.

"The demand for electric trucks has shown a marked increase and there will be a greater demand for this class of commercial cars in the future. Electric vehicles have been perfected to a point of being now as near perfection as they can be built. They are not only easier to handle but the average electric truck usually lasts three times as long as the same capacity gasoline truck. The initial cost is greater but in instances where the electric truck is applicable it is much less expensive than the gasoline truck.

"Our present sales policy is drawn up on a basis of the buyer paying for just what he gets. There are no fictitious high lists, no exchanges, no long time payments. This policy permits us to sell our trucks at a considerably lower price without affecting our high standard of quality. Thus we have greatly increased our sales.

Blames It All on Mexico

A local dealer who does a large business and who does not permit his name to be quoted, stated that May had been pretty dull and that the Mexican situation had a good deal to do with the unsettled business conditions. "We have not done the business which we anticipated, and, from what people tell us, it is all on account of Mexico. There are many prospective buyers on our list, but when we ask them why they do not purchase now, they say that they feel uncertain about the future and that until the general unrest throughout the country is dispelled they will not make investments."

Another dealer representing a big concern which makes both pleasure and commercial cars and who does not want to be quoted, said that as long as there will be a Wilson administration business will be dull. "There is plenty of money," said this dealer, "but people are afraid to take it out of the bank. We had a man in our salesroom who came from St. Clair county and who said that he needed two trucks and would have bought them several months ago but he feared that there may yet be war with Mexico and therefore he is waiting."

Michigan Car Registrations Thus Far Show a Gain of 15.8 Per Cent. Over Entire Year of 1913

DETROIT, MICH., June 17—Thus far this year 63,000 automobile licenses have been issued in the State of Michigan. This is already an increase of 8,634, or 15.8 per cent, over the total for all of last year, which was 54,366.

At the rate of $3 each, the automobile licenses have thus far augmented the state treasury by $189,000 in fees.

Chauffeurs' licenses thus far issued number 3,774. In 1913, all told, 4,837 were issued.

The state department has already refunded $100,923 which had been paid the state under the old horsepower taxation law which the Supreme Court declared invalid.

New Zealand—A Good Car Market

Prospects Also Favorable for Development of Truck and Light Delivery Trade

WELLINGTON, NEW ZEALAND, April 18—An opportunity for a big expansion of the motor car and general motor vehicle trade by American manufacturers and dealers is offered in all of the larger towns of New Zealand. While there is a preferential duty of 10 per cent. in favor of the English-made cars this is more than made up by the cheapness of American bodies, it is claimed by men here who are familiar with the trade situation.

The motor truck and light delivery vehicle have come into use only to a slight degree but prospects are favorable for a large increase in their number when their good points and usefulness are made known to the prospective purchasers. All of the principal towns, such as Auckland, Wellington, Christchurch and Dunedin, are well adapted for the use of motor trucks and delivery vehicles. With the exception of Christchurch the contour of the sites of the cities is very hilly, Christchurch is situated on a level scope of country where conditions for motoring of all kinds are ideal.

Notwithstanding the many hills that one has to climb in getting about the other towns as well as most of the territory that comprises the Dominion of New Zealand motor cars are in general use by the urban and rural population. In Auckland, as an illustration, there are approximately 1,400 cars, while in Christchurch the number is more than 2,000. In Wellington and Dunedin and all of the smaller towns the number is correspondingly large.

American Makers Not Getting Their Share

It is apparent that the United States is not getting its share of the motor car trade in New Zealand. Comparatively few American cars are to be seen here. In the country districts a considerable number of the cheaper makes are giving satisfactory service. The tendency of the buyers is towards light English cars. Not many Continental cars are sold. The average cost, laid down at New Zealand ports, of the English touring cars is about $2,250.

Buses and Taxicabs in Use

Motor buses are rapidly coming into use in the different cities of the Dominion. In Auckland the private-owned tramway system connects with an auxiliary line of motor buses, each having a seating capacity of 28 people. In Wellington where the street railway or tram system is owned by the municipality there are connecting lines of motor buses which are operated by private concerns. Some of these vehicles are of the double-deck type.

The taxicab is found in Christchurch and Dunedin. In Auckland and Wellington touring cars serve the purpose of the commercial type of vehicle. They are found in large numbers at all the regular street stands. All cars must be registered. A charge of $2.50 for a certificate of the proficiency of the driver is made for all vehicles. The license for all cars that are used for hire is $5 per annum.

Motor Spirit Is Fuel Used

Stove naphtha, or motor spirit, is used exclusively for fuel. Its cost to the consumer is $1.60 for a can of 4 imperial gallons. Oil explorations are going on in different parts of New Zealand, and the product is now being produced in small quantities. In one field several wells of about 200 barrels per day each have been brought in and a large refinery has been erected to treat the output. It is thought there may be a reduction in the price of gasoline brought about by the development of the crude oil industry which is beginning to show promise of such a possibility.

The worst feature of the motor car situation in New Zealand from the standpoint of future business is the absence of anything like a good road system in any part of the Dominion. This is one branch of the Government that has been sadly neglected. The highways in the rural districts, with hardly an exception, are atrocious. For several months in the year they are not only practically impassable for motor cars but they cannot be traversed with any degree of comfort by the old type of farm vehicles. Each district has its own road board and as a result of this system the making of good roads is a patch-work affair. The Dominion Government is considering the advisability of taking over the public roads of the two islands and inaugurating a systematic plan of improvement.

French Court Upholds Rudge-Whitworth Patents

PARIS, FRANCE, June 20—The French Court has upheld the Rudge-Whitworth triple-spoked wheel patent against Berliet, giving provisional damages of $2,000 against Berliet and provisional damages of $400 against Berliet and Tart. Against Faure, Promethee and Majola, the Court awarded provisional damages of $400 to Rudge-Whitworth, under the triple-spoked, wheel locking patent and spanner patent. The final amount of damages to be paid will be determined by accountants appointed by the Court. Some time ago the German Court also upheld the triple-spoked pan wheel patent.

Horses Accepted as Truck Payments

DETROIT, MICH., June 20—A sensation has been caused in the local commercial and industrial motor vehicle selling world by the announcement of the Thompson Auto Co., which handles the Commerce cars, that it would take horses and wagons in part payment in the sale of Commerce delivery cars.

As far as is known here, in the center of the automobile manufacturing world, no other dealers in the country have tried this new way of doing business with commercial cars.

According to the Thompson company, the very first day the announcement appeared in the local papers in the shape of half-page advertisements, quite a number of business firms became interested in the novel scheme. Not only will the horses and wagons be taken at their full value, but the cars may be paid on time. The price of the car is $975, of which $100 are to be paid in placing the order, $250 upon delivery of the car and the balance in weekly payments of $20. The car will be fully equipped, with choice of bodies.

Automobiles for hire lined up in Auckland, New Zealand

Markets Abroad for American Cars Widen

Prejudice Against American Automobiles Is Gradually Being Dissipated in Small Foreign Localities—Market for Tires in Sweden

LOW-PRICED American cars will find a ready market in Germany, especially Silesia. Road conditions in that country in general are excellent and adapted to cars of any type. A 44-inch tread will be satisfactory, but the right-hand steering and control are usual, although left-hand steering is known. Competition from American cars is being felt in this section of Germany. It is claimed that cyclecars ought to find a market there.

In Rhenish Prussia, thus far American automobiles and cyclecars have made little headway. Only those manufacturers who have established branch houses in Berlin or some other German trade center have met with any success, as the dealers and their customers are unwilling to purchase a car which they have not seen and for which they cannot quickly and easily secure extra parts in case of necessity. The type of car that is in demand is a four- or six-passenger touring car, with a four-cylinder, long-stroke, water-cooled engine, developing 12 to 20 horsepower. Wire wheels are popular, and light or medium weight cars only find sale. Cyclecars would also find ready sale there if properly introduced. It is claimed that the best way of successfully introducing American cars in this country is to establish general agencies in Berlin, or some other trade center, where spare parts may be quickly obtained. The German import duty on American automobiles and cyclecars is as follows:

On those weighing over 250 and up to 500 kilos (551.15 up to 1,102.3 pounds) net, 40 marks per 100 kilos ($9.52 per 220.46 pounds or $4.32 per 100 pounds); on those weighing over 500 and up to 1,000 kilos (1,102.3 up to 2,204.6 pounds) net, 25 marks per 100 kilos ($5.95 per 220.46 pounds or $2.70 per 100 pounds); on those weighing over 1,000 kilos (2,204.6 pounds) net, 15 marks per 100 kilos ($3.57 per 220.46 pounds or $1.62 per 100 pounds).

American Tires in Sweden

According to the Daily Consular and Trade Reports, there is a market in Sweden for American automobile tires. The United States sent $76,887 worth of automobile tires into Sweden in 1912, England and Germany alone leading it in these imports. A custom house forecast for 1914 indicates a larger trade in every respect. American manufacturers should be prepared to meet the Swedish purchaser a little more than halfway, and should also be prepared to make the exact size required by the Swedish buyer. A size often used here is 32 by 4 1-2 inches. German manufacturers get their money in Stockholm and give 3 months' wear and tear, and quote c.i.f. prices. There is but one tire factory in Sweden and it is quite unable to supply the home demand.

Trade in England Shows American Influence

In considering the general attitude of the British public toward manufactures of American origin it is gratifying to refer to the good influence of American automobiles. These have almost invariably justified every claim that was made for them, and at the same time have been sold at prices considerably lower than cars of a similar power and capacity of British or foreign origin. The old charge that followed the bicycle boom when some American cycles would not stand up to the work required of them is no longer heard. The satisfaction with American machinery and machine tools of all kinds, which had been creating a favorable impression for American goods even before the introduction of the American automobile, has continued to maintain the reputation of American products at a high level.

In connection with automobiles it should be noted that the one criticism now made is that in finish they are not up to the standard of the British product. This is due to the fact that hand labor is so generally used in the finishing processes on British automobiles, while mechanical methods are used almost exclusively in the United States.

American manufacturers have helped the sale of American automobiles by keeping spare parts in the United Kingdom in sufficient quantities to meet the requirements, and in certain cases, instead of being stored only in London, these may be obtained at almost any reasonably large garage. With some other American manufactured articles, it is unfortunately necessary to send to the United States for replacements or make them in England. British manufacturers have developed a light car of lower engine power, and consequently subject to a lower tax, than the American car, and this has steadily improved in efficiency. It appears to have filled a field that would otherwise have been filled by American machines, but it is not as low-priced as several popular American cars.

In one department of the automobile industry, that of commercial vehicles, the American manufacturer has not entered the British market to any great extent, except in the sale of light delivery wagons. In the latter class several American cars have considerable popularity, because they have in every sense stood up to the work required of them. It is the motor vehicles with a capacity of 1,600 pounds to 5 tons that the British manufacturers have not only been exceedingly successful in selling, but in making, so that they are in every sense worthy of British workmanship. The demand for this vehicle has been so great that the British makers cannot as yet fully meet it. Hence the market has afforded admirable opportunities for American commercial chassis that come up to the high British standard. The body design on the American commercial car is much different from the British and would probably not suit the market.

Light Electrics Attract Attention

In the lighter delivery vehicles the electric car, such as is made in the United States, attracted much attention in 1913, and several firms are said to be preparing to place similar vehicles on the market. One or two are said to have several already placed. The difficulty as to proper charging stations still exists, but electric lighting companies and the municipal undertakings that make electricity are more and more eager for the development of this new market for their power, particularly as batteries could be charged in the hours when electricity is not required for lighting and power purposes. It seems that this field deserves the attention of American makers, before British manufacturers take it.

A noteworthy effect of the introduction of American automobiles upon the motor car industry in Great Britain has been in connection with the sale of cars ready for use. Prior to the coming of the American car in considerable numbers the price of a British or Continental car did not include a number of accessories that were needed for its satisfactory use. Now the British manufacturer is coming more and more to quote a price for the complete car.

Seven Tours Laid Out for Electric Cars

New York Electric Vehicle Assn. Brings Out Book Giving Routes and Charging Stations in New York, New Jersey and Connecticut

NEW YORK CITY, June 19—The New York Electric Vehicle Assn., has sent out to all its members a book entitled Electric Touring containing a number of electric automobile tours in New York, New Jersey and Connecticut. The object of this book is to point out the adaptability of the electric car in suburban use. Several routes lying well within the mileage radius of the electric have been laid out covering these states. These routes were furnished by the Automobile Blue Book Publishing Co.

In all there are seven complete tours and reference to a map also given, readily indicating the towns and charging stations on each route. Each route contains on an average four charging stations, there being in all thirty-one charging stations for the seven tours. The stations are on an average 20 miles apart.

This book really comes at an opportune time, there being an awakening on the part of the electric people towards short tours and cross-country work. During the last few weeks for the first time the electric car manufacturers have been holding sociability runs and tours in a practical way. On May 25 the first run ever made by an electric car from this city to Boston inside 24 hours was made by a Bailey electric. The distance of 247.8 miles was covered in 23 hours and 9 minutes. The average speed for the trip was 22.8 miles per hour. The battery was charged at convenient points along the way when stopping for meals or for rest.

On June 12, another run was made by a Detroit electric. To show the capabilities of the modern high-powered electric car for general cross-country work, R. L. Heberling of the Philadelphia Storage Battery Co. and J. D. Maxwell, Jr., of the Detroit Electric Car Co., made a run from Philadelphia to Washington and back. The full running time to Washington was 8 hours and 53 minutes over a distance of 167 miles, maintaining an average speed of 19 miles per hour. Of course, the battery boosting stations again played an important part in the run.

An electric sociability run was held in Washington on May 27 under the auspices of the Washington Section of the Electric Vehicle Assn. of America. This was the first electric automobile sociability run. Fifty-four electrics were entered. The run in general was an unqualified success.

All this goes to show the general turning of the electric people towards fields heretofore really covered wholly by the gasoline-driven automobile. The establishing of convenient charging stations along the main routes of the different states has helped to solve the problem of long tours in electrics. Take for instance Tour No. 1 given in the book mentioned. The first charging station is Paterson at a distance of 14.2 miles from this city. This tour is from this city to Morristown and return. Though this is a short distance from the starting point, the added boost, say after the first hour's run, would serve to give the car enough power to take it to Morristown, about 27 miles from Paterson. The trip back would be by way of Summit, Elizabeth, Port Richmond, Staten Island and across the ferry into the city. The next charging station after Paterson is Summit, about 49 miles distant. A party

Folder map from the book, Electric Touring, brought out by the New York Electric Vehicle Assn., and containing seven routes for tours in electric cars, giving the location of charging stations on each route. The map and routes were furnished by the Automobile Blue Book Publishing Co.

starting out about 8 o'clock in the morning from this city would make Summit just in time for luncheon, by maintaining an average speed of about 20 miles an hour. The next charging station is Elizabeth, about 8 miles. Though this may not be needed, it goes to show the frequency of the charging stations throughout this state. The same conditions prevail in New York State and Connecticut. There are several delightful tours laid out for electric car drivers in those states.

The new movement on the part of the electric car owners may be summed up in one sentence: they have found that by placing stations in convenient spots throughout the states, where the average motorist is apt to go, the electric car owner can go anywhere he pleases and to places where he has not heretofore dared to venture.

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Varied Design in Isle of Man Racers

DETAILED descriptions of the various machines entered in the Isle of Man race, June 11, are of especial interest because they indicate the latest product of the British designer and show, to some extent also, what may be expected in car design, for the other big European races.

Last week the mechanical features of the first six cars were given and below are descriptions of several of the other British cars that competed in this race, and while these machines did not win any of the money they are none the less interesting because their characteristics show the development that has occurred in the past year.

The 16.7 horsepower Humber engine has four cylinders arranged in a monobloc casting, the bore and stroke being 3.2 by 6.1 inches. The valves of B. N. D. steel are driven by an overhead gear. Three-point suspension is used for the engine unit, the aluminum base-chamber being mounted on a U-shaped sub-frame, at three points, one in front and two at the rear. On the near side of the engine is the carbureter, while the exhaust and the magneto are on the off-side. Cooling is by pump, while forced lubrication is utilized.

With regard to the transmission, there is a leather cone clutch, having an aluminum member, with the clutch spigot on ball bearings and running in oil. There is a universal joint at each end of the clutch shaft which is of the internal gear type. These universal joints are of special steel, and so designed as to run in an oil bath, thus giving a perfect clutch slide. The diameter and weight of the joints have been kept as low as possible, to insure easy gear changing. The clutch withdrawer mechanism consists of a heavy type thrust bearing, likewise running in oil, and carefully housed to prevent undue movement.

Gears Are Coarse Pitch

In the gearbox are four speeds forward and one reverse, the wheels, of B. N. D. steel, being of coarse pitch. The gearbox, which has the gate mounted upon it, is suspended from two cross members at three points. A large internal expanding brake is fitted behind the gearbox, and is so arranged that the driver can effect adjustments while running.

The rear axle is a one-piece steel pressing, with the wheels mounted on the ends, so that the cross-shafts take the drive only. Bolted to this steel pressing is the bevel housing carrying the whole gear, and the removal of the very large cover-plate on the rearward side of the casing renders the gear very accessible. Large diameter internal expanding brakes are used, and all the brake drums have cooling webs arranged on them. Semi-elliptic springs are placed directly under the main frame, and in addition to the shock absorbers, which are fitted to the axles, strong straps attached to the rear cross-member of the frame prevent excessive movement of the axle.

The cars which represented the Star company in the Isle of Man race were designed upon strictly standard lines.

Nevertheless, the exacting demands of the course were carefully considered. Every effort was made to produce a car thoroughly stable at all speeds and yet light enough not to be handicapped when climbing or accelerating.

The general run of the car is very low. The wheelbase is 110 inches, being just outside the minimum 108 inches, but the standard tread 57 inches was unaltered.

The engine, which is on standard lines, is a four-cylinder, with 3.5-inch bore by 5.1-inch stroke, giving a capacity of 198 cubic inches. The valves are all on one side and operated by a single camshaft driven by a silent chain. The valve caps are water-cooled in view of the high compression used. The crankshaft runs on five plain bearings, drilled for lubricating the big ends. Forced lubrication is used throughout to both cam and crankshaft.

The weight of the car ready for the road with driver and mechanic comes just below the minimum weight allowed, so that a small amount of loading up was necessary. This is quite an advantage since it enabled the weight to be disposed to still greater advantage.

The bench tests of the engine were very satisfactory, very high revolutions per minute being attained, and kept up with comfort. The power was very satisfactory, the curve running up to 3,300 revolutions per minute without falling off, and this was borne out on the road. The car, although running on a fairly low gear, has done 90 miles per hour.

Crossley a Stock Model

The Crossley car is fitted with an engine of 3.1-inch bore by 6.2-inch stroke, the chassis being built up on quite conventional lines. The engine is not specially designed for racing purposes, but one of the standard touring type engines fitted with special details for the race.

The valves are arranged all on one side, operated by a single camshaft, in accordance with general practice. One interesting detail might be noted, and that is between the dumb irons on the front of the chassis is a tank with gilled cooling ribs. This contains the oil which is drawn by means of a pump to the engine bearings.

The engine of the Vauxhall cars is 3.5-inch bore by 5.1-inch stroke, the engine and car being specially designed for the race. The inlet valves are on the top and there are four valves to each cylinder. The camshafts are driven by means of a vertical shaft having a bevel wheel at the crank end and a worm at the top end, which operates the camshafts right and left. Special arrangements have been made with this engine for the cooling of the oil. The under-cover of the crankcase is constructed of sheet copper, ribbed, and in addition there is a large ventilator which admits air to the base chamber by means of a pipe carried through the bonnet after the form of a ship's ventilator.

All the reciprocating parts are very light, the pistons being of cast steel. Balance weights are fitted to the crankshaft. These engines are reported to have turned as high as 3,500 revolutions on the testing bench.

The flywheel is constructed of a disk of metal to which is riveted a circular flange, which receives the cone of the clutch. The fiber lining, however, is not fitted to the sliding member but to the inside of the flywheel flange, it having been found at high speeds that the centrifugal force tends to loosen the fiber when attached to the external diameter of the cone. When, however, fitted to the flywheel the centrifugal force tends of course in the opposite direction to bind the fiber closer to the surface of the metal.

The radiator is not attached to the side members, but is entirely fixed on the front cross member, the idea being to prevent the straining of the radiator by frame defections.

Automobile Design and Relative Motion

If Engineers Would Study the Work and Motions of Car Parts They Would Make Better Cars—Brakes Furnish Example of Incorrect Design

Report of a Lecture Given Before the Institution of Automobile Engineers in London by Dr. A. W. Low

LONDON, ENG., June 15—At a lecture given before the Institution of Automobile Engineers May 27, Dr. A. M. Low discussed the question of relative motion and the application of a study of this subject to the design of automobile parts. As reported in *The Autocar:* He pleaded for more sympathy between the designer and the part which was being designed. The fact that there is this want of sympathy between the designer and the part being designed, he said, could be proved, for instance, by anyone going about London and noticing the way in which so many shock absorbers are fastened to cars in an absolutely wrong way. The designers seemed to have assumed that the car was standing still while the wheels proceeded over the bumps, but if they had imagined themselves traveling on the back axle to which the absorbers had been fastened they would at once have realized how to fit them, as they would then have discovered how to split up the motions that were occurring.

Less Trouble with Front Wheel Bearings

If people would realize this point of view also in other directions there would not be so much trouble with front wheel bearings. Another case in point was the trouble experienced with the ordinary carbureter. A designer would make a carbureter which was more like a clock turned inside out, and fearfully complicated. It was corrected for everything, and finally the needle would be taken out and put in a vise, and very carefully marked out. Then the designer would proceed to bolt it on to the engine of a light car, which shook the whole thing up and down violently. This was what he meant when he spoke of relative motion and the necessity for taking it into consideration when designing cars.

The question of brakes, again, was very interesting. People usually looked upon these as consisting of a brake drum and a shoe working up against it, and seemed to be content with fastening the drum on tightly and arranging the shoe against it. Supposing, however, this matter was regarded from the point of view of the brake drum itself, and the fact that it was always turning round in one direction neglected. What was happening? The shoe was sticking to the drum and springing back again continually. Some time ago he made a little machine called a "chattergraph," which could be used for studying the springs of a motor omnibus, but when it was fastened on to a brake drum it was possible to obtain a graph of what was happening whilst the brake was being put on. This showed that the anchorage was attempting to turn round with the drum, and chattering resulted. If the brake were considered from the point of view of the motion between the drum and the shoe, this chattering could be done away with very easily. The anchorage could be sprung, or the shoe could be split up. The difficulty was well overcome by the type of brake used on the Lanchester car, which was, in his opinion, an example of a proper study of brake shoes.

Dr. Low then went on to a consideration of the possible methods for studying motion, but laid special stress upon the necessity for a form of study which he did not think had received quite as much attention as it might have received, namely, the use of the cinematograph. The first direction in which he referred to its use in connection with motor car construction was in the case of the exhaust valve. The poppet valve was efficient in a way, but it formed a part of a spring closed chain of mechanism. That being so, it seemed of very little use designing cams with the greatest possible care unless one considered the means of damping the vibration of the valve. A little time ago he came across a case of a high-speed motorcycle engine in which the valves were always breaking, and, observing these by the aid of a cinematograph through the exhaust pipe, it was discovered that the valves were distinctly bouncing back again off their seating, and a form of spring check was devised which overcame the trouble. This, he thought, was an interesting example of the useful application of the cinematograph which enabled one to watch how the bouncing of the valve synchronized with the various speeds, and it brought home also the importance of having properly designed valve gear.

In another direction he had used the cinematograph with very interesting results. There were a number of motorcycle engines in which the lubrication was effected by mixing oil with the gasoline, and it had occurred to him that as the oil was vibrating, particles of lubricating oil would be left in the induction pipe. The experiment was carried out of placing a shutter in the pipe which could be revolved with great accuracy by means of a cam from the shaft, and to watch through this until the turbulence in the pipe more or less died away.

Most Pedals Are Incorrectly Designed

After showing the application of the cinematograph to the study of an aeroplane propeller, Dr. Low briefly referred to the design of pedals, most of which, he said, were quite wrong. If one thought of this matter carefully in the light of relative motion, one must come to the conclusion that the pedal ought to be absolutely stationary relatively to the body of the man pushing it, but how many cars were there whose pedals remained absolutely in a constant position on the foot the whole time? If it were so it would add enormously to the comfort of driving. The foot ought to remain stationary, and the pedal ought to move relatively to the body and not relatively to the foot. Some makers attempted to get over this difficulty in a way which left one point only touching the foot, which was not comfortable. Others pivoted the pedal, which meant that the pedal was insecure, and allowed slip unless there was a rubber cover. He himself had devised a scheme by which the foot had always practically the full area of the pedal to stand on.

Reference was next made to bevel gear. This, said Dr. Low, frequently set up all sorts of incredible screaming noises, which, however, could often be stopped in a very simple way when studied by the aid of the cinematograph.

An actual consideration of the problem from the point of view of the bearing itself would make one careful where the ball race was placed.

Speaking generally, the lecturer said there was little use in designing a car as if one were in an armchair sketching out the parts with a pencil. One must imagine oneself living on the car—although that might be very horrible—and if this were done one speedily became aware of wrong design.

Recent Court Decisions

By George F. Kaiser

Driver May Turn to Left To Pass

ANOTHER case holding that the rule of the road which requires that a motorist must pass an approaching car on the right may be disregarded under certain circumstances has just lately been decided in Washington.

In a collision between two automobiles, the first motorist claimed $1,325 damages to his automobile, and the second motorist put in a claim for $2,900 for injuries to his automobile and to himself. Judgment was given to the first motorist, however, in the sum of $925. The accident occurred on the Pacific highway, about 12 miles from Tacoma. The first motorist was going 20 miles per hour, and the second motorist was going from 30 to 35 miles per hour. As the latter approached the former he curved to the left; the former then turned to the left to avoid a collision, whereupon the other motorist turned to the right and ran into him. The court said that the first motorist was not guilty of contributory negligence in turning to the wrong side of the road, as a reasonable man would have done the same thing, under the circumstances, and that being the case he was well justified in disregarding the rule of the road which holds that approaching vehicles should be passed on the right.—*Lloyd vs. Calhoun*, 139 *Pac.* (*Washington*) 231.

Right to Tax Chauffeur

Washington court holds that the motor vehicle act which levies $2 annual license fee on chauffeurs and persons driving cars for hire is constitutional, even though owners and amateur drivers are not likewise taxed.

A chauffeur was arrested because he refused to pay the $2 annual license fee under the provisions of the Motor Vehicle Act (St. 1913, pg. 639). He contended that the part of the act taxing chauffeurs was unconstitutional, but the court held that as a person is apt to be more careful of his own property than the property of others, and as chauffeurs do not drive their own cars but are entrusted with the care of other people's property, they are more apt to be reckless while driving than the owner. The chauffeur's application for a writ of habeas corpus was therefore dismissed and he was remanded to jail—*Ex parte Stork*, 139 *Pac.* (*Cal.*) 684.

Boys on Highway

Motorists must expect that boys out for a holiday in a public park will jump about and cut up generally, says a Massachusetts Court.

A boy's parents sued a motorist for the boy's death. It seems he was a boy of 11 years, and, in company with twenty-five or thirty other children, was skipping and running across Revere Beach Boulevard when the motorist approached. A man ran out and stopped some of the children and held up his hand for the automobile to stop. The boy who was killed was one of those who stopped when the motorist, going at a speed of 15 or 20 miles an hour, and, sounding no horn, did not stop on seeing the boys until one was run down. The Court said that the boys need not have expeeted the automobile to run through the crowd, as a boulevard was not a race track, and said that the motorist was operating his car at a speed "greater than is reasonable and proper, having regard to traffic and the use of the way and the safety of the public," and accordingly held him liable for damages for the boy's death.—*Clark vs. Blair*, 104 *N. E.* (*Massachusetts*) 435.

Motorist Not Negligent

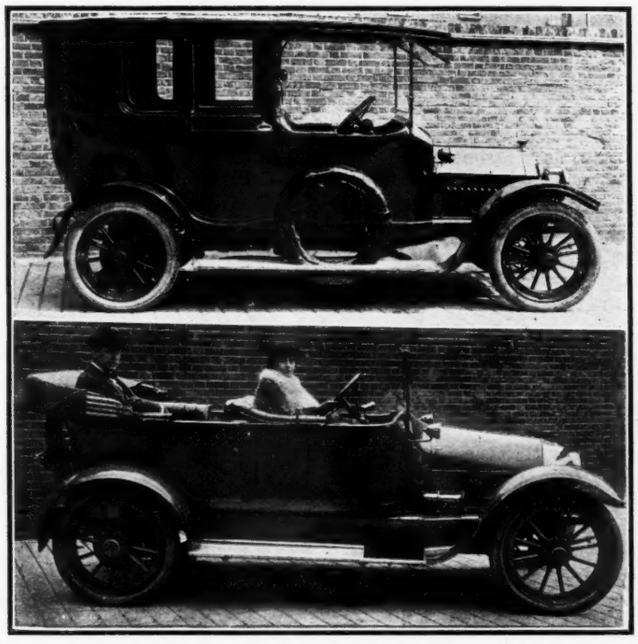
In a recent Rhode Island case the Court held that a motorist is not negligent when he is driving his machine at a reasonable speed, 7 miles per hour in this particular case, at a safe distance behind an electric car.

A motorist was driving his automobile with three friends as passengers along a street following a street car. He reached a point where a pile of dirt was on one side of the street and two wagons were on the other side and a car was coming the other way. When the automobile was opposite the space between the two wagons a boy of 8½ years ran out against the right mud guard of the automobile and was injured. The motorist was sued for damages but the Court held that he was not liable as he was using due care under the circumstances.—*Curley vs. Baldwin*, 90 *Atl.* (*Rhode Island*) 1.

$5000 for Injuries by Train

An Indiana Court says that the same rule applies to automobiles as to pedestrians and drivers of other vehicles when crossing a railroad track as to the amount of care they should use, which is that degree of care that an ordinary prudent person would use under the circumstances.

A motorist on approaching a railroad crossing stopped his machine and looked and listened. A locomotive and freight car passed and after looking and listening again he started over the tracks. A train came along, hidden from his view by a high freight car, and as it did not give any signal with a bell or whistle, and as there was no watchman at the crossing, the automobile was struck by the train. The Court allowed the motorist $5,000 for his injuries.—*Central Indiana R. R. Company vs. Wishard*, 104 *N. E.* (*Ind.*) 593.



Above are illustrated two adaptations of our American built cars in England which show the possibility of developing entirely different looking cars on the same chassis. The upper shows an English landaulet body fitted to an Empire chassis, while the lower part of the illustration shows an English touring car body with sloping hood and modified radiator and crowned fenders on an Empire chassis

Claims Interliners Double Tire Mileage

The Automobile Engineers' Forum

Finds Use of Auxiliary Shoe and Tube Protectors Is Practical in New Tires as Well as in Those Which Are Old and Worn—Lack of Pressure a Factor

AUBURN, IND.—Editor THE AUTOMOBILE:—There is at present a growing interest in auxiliary tire protection. We make our Interlocks to exactly the same tread diameter as the inside of a standard tire, and we consider accuracy in this so important that in making a recent check-up of our tube circumferences of various sizes as against the corresponding measurements of standard tires we were in the majority of cases exactly the same, and in no case more than a quarter of an inch off, which would mean a variation of less than 1-16 in diameter. The interliners contract a little when they are taken off the core in the setting of the rubber, and this allows them to go in easily. They are so made that there is a little stretch left in the tread so in case of an old tire having enlarged a little the Interlock will stretch to a fit under pressure.

In the cross diameter we make the ordinary open edge reliner the same measurement as the bead-to-bead measurement of the tire, while the Interlocks have overlapping flaps and are made so that these close easily inside of the rim avoiding any difficulty in putting on the tire and it then goes to its proper position under pressure.

Study Required To Avoid Chafing

There is a big lot of study in this matter of tread and rim size and in the particular height which a flap should go to enable same to lock properly and yet not to go up high enough to reach the point where there will be any motion or chafing of the tube, and it is only by experience that we have been able to do this, but we don't believe we have had a case in the last year in which there has been any fault in this respect on the Interlock.

The materials used are cotton duck frictioned with rubber, and in the better grades also skin coated with rubber. The duck varies in quality from ordinary hose duck in cheap reliners, to close-woven Egyptian fabric in the Interlock.

We advise the use of an interliner in casings which are very much the worse for wear provided that any actual breaks are first properly repaired so that the tire simply becomes an old, weak tire, but without any actual breaks in it.

It is quite true that an interliner may be put into an old tire after breaks are in it, and sometimes give a surprising amount of service, the interliner simply acting over the broken place the same as a blow-out patch would. How long such a condition will hold, would depend very much on how large the break was and also upon whether its edges were of such a nature as to cut or not, and we feel that we serve our customers best when we prevent them from spoiling a great many interliners by trying to use them under unreasonable conditions.

While there is frankly some difference of opinion among the members of our own company as to whether or not it is advisable to put interliners into new tires, the writer's personal belief is very strongly in favor of the idea to put them in new casings. My reason for this belief is because we all know that the thing which causes the blow-out is simply some extreme blow, such as striking a rock sharply or going over a high railroad track, and that this simply puts a strain on the fabric greater than it can stand, with the result that some of the threads are broken. We all know that the blow which breaks may just as well come about at one time as another, and that very frequently the damage is done fully a thousand miles before the tire finally blows out. My reason therefore, for advising the use of interliners on the start, is that it gives the tire so much extra strength that there is practically no possibility of damaging the fabric, and the tire is strengthened, and bound to go to the extreme limit of wearing it through from the outside.

Tires Wear from Outside Only

My own personal experience has strongly corroborated this fact in the last 3 years. In this time I ran over 7,500 miles per year, I have not in a single case ever had such a thing as a broken tread and every tire invariably wore out only as it wore out from the outside; one set of tires was deliberately bought seconds, in which the tread fabric had been buckled and partly shaved off, but they gave equal service.

Not in a single case have I had any trouble with heating or with loosening of treads, except such as others we e having with that particular make of tire at that particular time, or have I been able to find a single objection; and the satisfaction of knowing that there is no danger of blowouts is certainly worth a lot.

The vital point, however, in the use of interliners with new tires is that the pressure must be constantly kept up, otherwise the interliner, being inside where it flexes most sharply, and therefore receiving the hardest part of the work, would be unable to stand up and do its full share.

An Ounce of Prevention

The theory on the part of those who advocate not putting in interliners until the tires have run a considerable distance, (some say 1,000 miles, some say 2,000) is that they think the average customer is likely to be careless about his pressure and will therefore be apt to wear out his interliner before he does his tire, and then blame the interliner without giving consideration to the better condition of his tire. My answer to this is, admitting that this happens occasionally, you must also remember that the average owner who "intends" to strengthen his tires with interliners at the 2,000-mile point, will nine times out of ten simply put it off until he gets a blowout and probably finds the fabric in his tire badly damaged.

In regard to the increase in cost of mileage in case you use the interliners, as against those which are used without them, our claim is simply that the interliner will make the fabric the longer lived part of the tire and your tire will wear until it is legitimately worn through from the outside. We claim, and the scrap heaps show, that the majority of tires are scrapped because of fabric blowouts and rim cuts,

before the tread is more than half worn out; and that therefore the use of the interliners will, on the average, just about double the mileage of tires. This mileage will naturally vary greatly from two different standpoints.

Getting 10,000 Miles Out of Tires

For example I wore out some tires 3 years ago from the outside in 4,500 miles, because of the fact that a big part of the mileage was on rough mountain roads and during the rainy season. Under this condition of wet rubber and sharp rocks, the tread naturally wears off quickly. The same make of tires on another car with practically the same care lasted that season about 7,500 miles on Indiana roads, and the only reason they did not last longer was because the treads were not put on properly and were inclined to loosen. Again the following year the same make of tires on the same two cars both averaged over 10,000 miles per tire, the reason for this increase being that the makers had learned how both to make a tougher tread and to prevent it loosening from the carcass. During both of these seasons other cars of the same make and using same tires in the same neighborhood, were complaining of the fabric of the tires being poor, and on the average were discarding them between 2,500 and 4,000 miles, because of blowouts.

We trust that the above will answer your questions thoroughly, and if any points are not clear we will be glad to take them up with you.

Lack of pressure has a peculiarly strong bearing on the interliner. For example, if a tire is accidentally run flat and hasn't an interliner inside the tire, it will most invariably be ruined, but if it is equipped with an interliner the liner will form a buffer, which will prevent the tire from bending extremely sharp, and the result will be that the interliner will be broken, although the tire may not be damaged at all. Under such a condition the customer of course ought to congratulate himself on having saved the more expensive article, but the actual result is that he is much more apt to jump at conclusions and say the interliner was no good.—A. L. MURRAY, President, Double Fabric Tire Co.

Says Inner Liners Will Save 25 Per Cent.

CLEVELAND, O.—Editor THE AUTOMOBILE:—We make inner liners for all sizes and makes of tires, and our inner liner fits the tire completely inside, from bead to bead.

We do not use any shoddy or reclaimed material. These liners are all made of the very highest and best grade of long staple cotton tire fabric with high quality rubber friction. They are stitched together in a quilted form to prevent separation and they are made and cured to the correct form and size of the inside of tire over an iron core in exactly the same manner and care in which a tire is made.

We do not advise the use of our liners in very old casings unless the fabric is in good condition and the tread is not worn away, in which cases our liner can be used in the casing for a considerable length of time and then can be removed and used in another casing.

Advises Use of Liners in New Tires

We advise the use of our liner in new tires, or when they have run only a few hundred miles because the liner then reinforces the tire, which prevents the great majority of punctures and blowouts that take place. The reason we recommend them for new tires is also because the great majority of owners will say, "I will let my tires run until I have some trouble," and in the majority of cases it is then too late to give him the best and most satisfactory results.

We can safely say that the great majority of troubles with automobile tires is the fabric trouble and 75 per cent. of tires never wear out, but they go to pieces internally, causing blowouts and damaging the inner tube, whereas another trouble is that when there is a puncture the majority of people run a few hundred feet or to a garage or to a shady spot to change this tube, and this few hundred feet of running in a flat condition will do more damage to the carcass of the tire than running the tire a thousand miles or more and in many cases will completely ruin the tire.

By the use of inner liners in new or practically new tires we claim that 90 per cent. of blowouts and punctures will be eliminated and by so doing they will reduce the tire expense 25 to 40 per cent. The great trouble with inner liners has been that they have not been properly inserted in the tire and they would creep and go to pieces entirely. Our inner liners are specially coated with a vulcanizing cement so that when properly inserted they become practically a part of the tire. Being stitched together in the manner in which they are made they will not creep from their position, and will not separate, and they will not injure the inner tube. Our liners are also specially coated on the side that goes to the tube with a preparation that eliminates friction.—E. T. HORSEY, President and Manager, Horsey Mfg. Co.

Liners Reduce Resilience of New Tires and Destroy Fabric

AKRON, O.—Editor THE AUTOMOBILE:—We recommend the use of interliners in casings that are practically used up or show signs of giving away. To get the best service they should be cemented inside the casing, using a self-vulcanizing cement. If put in loosely they are very apt to chafe the inside of the casing and to generate heat from the friction, causing the tires to deteriorate much more rapidly than they would otherwise. We strongly advise against the use in new tires, as they undoubtedly do more harm than good. For a temporary emergency in case of an accident to tide over until permanent repairs can be made the interliner is all right.

A tire is scientifically made and the adding of any number of plies of fabric is detrimental. The employment of an inside band not only reduces the resilience of a tire, but the additional thickness creates heat, which is not only destructive to the fabric, as shown in the sketch, but weakens the adhesive qualities of the rubber between the plies of fabric and blistering follows.

We make our interliners from the best friction fabric coated with pure rubber and vulcanized in the same manner as the regular tire casing. The sizes run from 3 to 5.5 inches inclusive.—THE B. F. GOODRICH CO.

Cement Should Be Used to Vulcanize Liner in Place

AKRON, O.—Editor THE AUTOMOBILE:—We make reliners in all sizes from 28 by 3 to 38 by 5.5 inch tires of all sorts. Fourteen ounce American cotton of special weave is used in the construction and this we find to be as good in regard to wearing qualities as anything we can select.

We do advise using reliners in casings which are pretty badly worn, but they should be applied very carefully and if possible cement should be used, vulcanizing the reliner to the tire. We would not recommend putting reliners into new tires.

We do not guarantee any given number of miles can be had from using reliners at any time. However, a careful driver will invariably prove reliners to be a profitable investment.—THE MILLER RUBBER CO.

The Rostrum

Specifies 2-Cycle Motor for Ideal Car

EDITOR THE AUTOMOBILE:—As the S. A. E. are to take up the matter of the Ideal car, why not the user? While not an engineer, I have driven thousands of miles over all conditions of roads in different sections of the United States, both in city and country work, and the following specifications the writer would make use of for a runabout for all-around work anywhere on the road:

Wheel base, 110 inches; wheels, 34 inches; pressed steel with demountable rims, and Timken bearings. Tires, 34 inches by 4.5 inches by 4½ inches. Rear axle, full floating with spiral bevel gear. Springs, front, semi-elliptic; rear, three-quarter platform, made for weight of car with equipment and two average passengers, Gearset, amidships, 4-speed and reverse, direct on high gear, the ratio being about 250/275 to 1. Universals, two—one between engine and gearbox, the other between gearbox and drive shaft. Left drive with center control. Both brakes on rear wheels; service external, emergency internal. Clutch, single plate type. Motor, 3-cylinder, two-cycle of 40/45 horse power, thermo-syphon circulation. Electric generator with storage battery for lights and ignition through Atwater-Kent system. Generator to have slip clutch coupling so as to be cut out in daytime when not needed. No starter. Body semi-racing to suit driver's length of legs and arms, with cowl dash and gasoline tank in same. Weight of car, 2,000 to 2,500 pounds. All parts to be of best material and workmanship and bushed for easy replacement at all points.

A car built as above would be capable of 55 to 60 miles per hour, and while not able to climb everything on high—we are not going up hill all day—would have a moderate speed motor with few moving parts to wear and need little attention.

Paterson, N. J. H. W. GINLEY.

Legible Signs Erected by Hoosiers

Editor THE AUTOMOBILE:—Fig. 1 shows one of the new danger signs that have been placed at various points on the roads in and around Indianapolis, Ind., by the Hoosier Motor Club. The sign illustrated is of interest because it is a good example of what such a sign should be like. It is neat and simple and yet pleasing to the eye and at the same time the lettering stands out clearly so that the warning can be read, without difficulty, far enough away from the turn to enable the driver of a car to slow down, even when traveling at a high rate of speed.

Indianapolis, Ind. J. C. C.

Gets 92 M. P. H. from Cole Four

Editor THE AUTOMOBILE:—Two views of an interesting racing machine which has been built by George W. Johnson, at Forest Hills, L. I., are shown in Fig. 2.

The engine was originally a stock four-cylinder Cole engine with 4.5 by 5.25 inches bore and stroke, with a displacement of 334 cubic inches. The moving parts, especially those of the crankshaft and pistons, have been lightened by machining away excess metal wherever possible and by drilling, so that the increased speed at which the engine operates under racing conditions is possible without undue shock or vibration.

The oiling and gasoline systems have been put on a pressure basis, the gas being carried in a tank low down in the center of the rear compartment, and the oil supply in a streamlined tank on the left side of the car.

The valve timing has been altered in order that the valves may operate properly with the quick timing cams which were installed, and the spark has, of course, been advanced in accord with the increased speed of the engine.

The cooling system is a combined pump and thermo-syphon system and the water passes through a standard type of radiator, but owing to the fact that the radiator is shielded by a pointed forward hood or wind-splitter, an auxiliary fan turning freely on ball-bearings and not driven from the engine, is mounted in front of the radiator in order to distribute the inrushing air evenly over the cooling surface.

The transmission has, of course, been altered in order to give much higher speed and the engine and transmission are mounted on a drop frame chassis suspended on especially made oil-hardened springs. The steering gear has been carefully adjusted so that there is no excess freedom of movement, and the steering post has been given a considerable rake so as to bring the wheel in close to the driver. The driver's seat is also 14 inches in front of the mechanic's seat so that they both may have plenty of room and not interfere with each other. The tires are 34 by 4 inches front and 34 by 5 inches rear and for road racing, provision is made for carrying, on detachable arms, extra rims and shoes.

The body is especially interesting and shows careful attention to elimination of wind resistance, it being brought to a sharp point at the rear in order to eliminate suction drag when traveling at high speed. Compartments are arranged in the rear of the car which will hold a total of over 200 pounds of sand which can be distributed all on one side or evenly as may be desired to meet varying conditions of track

Fig. 1—Danger sign erected by Hoosier Motor Club

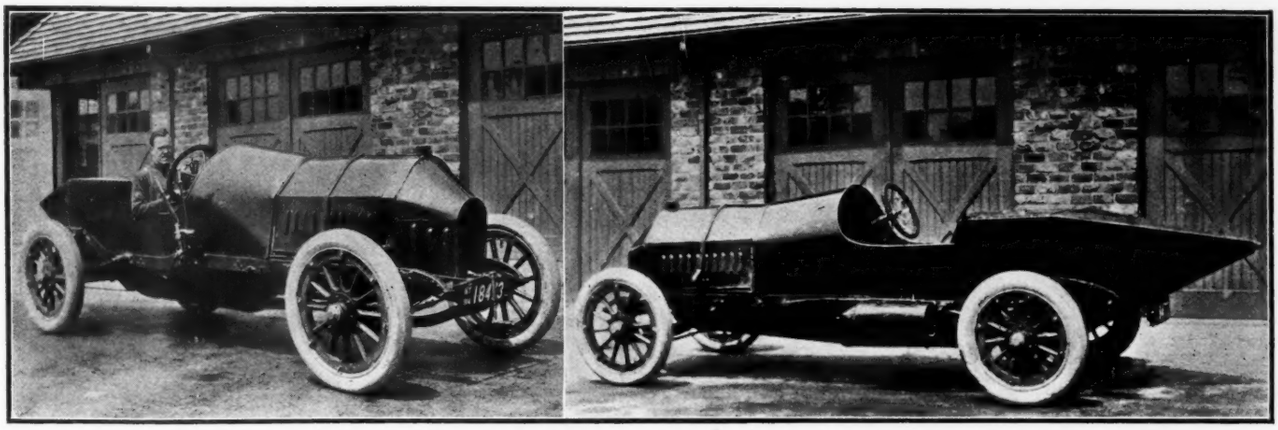


Fig. 2—Two views of four-cylinder Cole that has been tuned up to do 92 miles per hour

and road races. This idea is similar to that employed in the Peugeot racing cars to give stability when rounding curves and to keep the rear driving wheels in contact with the surface at all times.

The best time made with this machine so far is 92 miles per hour, although it is hoped to get it up over 100 after the car has been sufficiently tuned up. Over 12-mile stretches it has averaged 80 miles an hour.

New York City. K. G. MARTIN.

How To Adjust Reo Axle

Editor THE AUTOMOBILE:—Kindly explain by sketch how the Reo rear axle works and how the adjustments are made.

St. Francis, Minn. A READER.

—Referring to Fig. 3, the construction of the Reo rear axle is shown so clearly that its operation should be comprehended without difficulty. Beginning with the universal joint on the driveshaft, the power is transmitted through the pinion shaft to the bevel pinion where the motion is taken by the bevel gear. The latter is riveted to the differential casing which carries the differential pinions. When the car is traveling straight ahead, the power is transmitted directly to the two differential gears which are fastened to the axle shafts. The axle shafts are keyed to the wheels.

When the car rounds a corner, one wheel travels faster than the other and this is compensated for by the differential gears and pinions.

There are two adjustments on this axle, one that allows the movement of the big bevel gear so that it may be brought into closer mesh with the bevel pinion, when wear occurs, or in the initial adjustment when the axle is assembled, and the other is the adjustment of the bevel pinion so that when wear occurs it may be brought into closer relation with the bevel gear.

The former is adjusted by removing the rear of the axle housing, and turning the threaded rings that carry the two bearings at each side of the differential gears.

The bevel pinion is adjusted by turning up on the sleeve S, while the bearing adjustment of the pinion shaft is accomplished by slowly rotating the sleeve P.

By shifting the big gear endwise and the driving pinion in and out, the correct alignment of these gears may be easily obtained. A slight amount of back lash between the gears is desirable, the exact amount being about double the thickness of the paper on which this magazine is printed.

The position of driving pinion and gear relative to each other is very important. Noisy gears are usually noisy on account of the relative position of the pinion and gear not being correct, and, providing the gears run true, the noise can be stopped by the proper setting of the pinion with respect to the large gear. It has been found that if these gears are out of position to the extent of 1-100 inch or more the gears will be noticeably noisy. The exact adjustment for quiet running can best be obtained by trial, care being taken not to set the gears too close.

Valves Carbonize Quickly

Editor THE AUTOMOBILE:—I would appreciate it very much if you would kindly give me your advice in regard to my engine, which was built in 1910.

About a year after I purchased my car I began to have trouble with carbon on the exhaust valves, which made it necessary to grind the valves every 400 or 500 miles. I have tried different kinds of carbon removers, kerosene and denatured alcohol, with absolutely no effect on the carbon

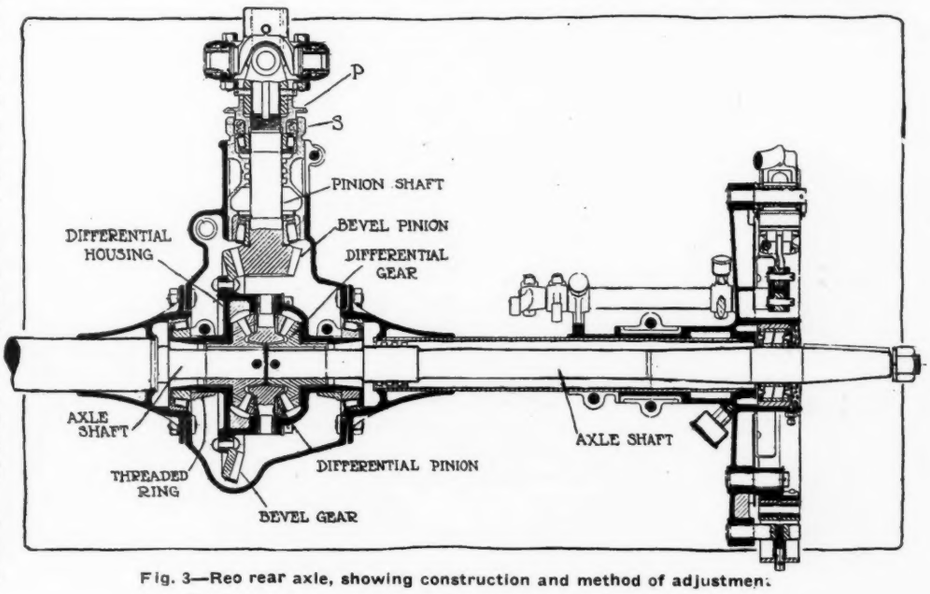


Fig. 3—Reo rear axle, showing construction and method of adjustment

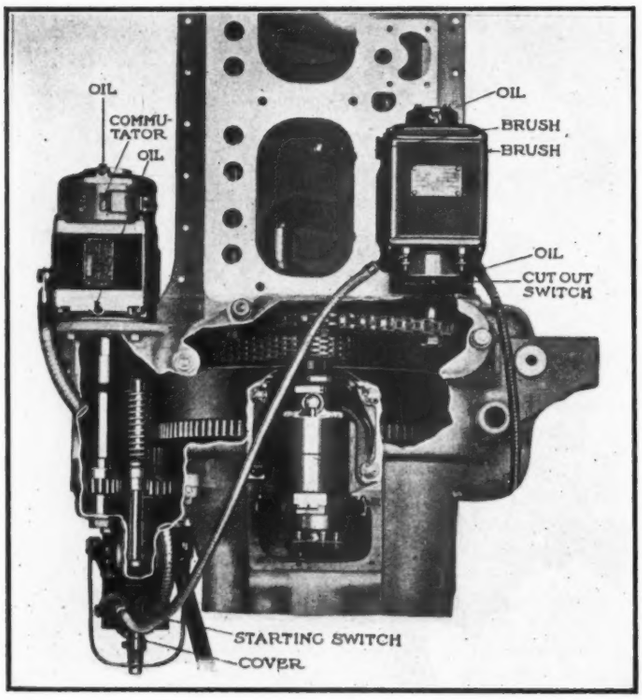


Fig. 4—Hupmobile starting and lighting system

on the valves or the carbon in the engine. I have always run my car with the gasoline cut down very low, and I am absolutely certain that the trouble is not from too much gasoline.

Until this season I have been using Polarine oil, while this season I have been using Mobiloil A, and have water-jacketed my carbureter, which is a Model L Schebler, but I have been unable to get rid of the trouble, nor have I been able to lessen it. The engine does not get excessively hot, as the water never boils. I have an Atwater-Kent ignition system and run with the spark advanced as far as it will stand. The ignition gives no trouble.

It is possible that the trouble is in the piston rings, but I hardly believe so for the reason that after the valves are ground the compression is good and holds well. Besides, I have examined the rings and they are bright all the way around and do not show any dark spots, which would indicate the escape of gas past them.

The valves have slight shoulders on them from the large amount of grinding they have had, but this should not cause any trouble, as the valves seat perfectly after grinding. The valve stems and guides are slightly worn and I notice whenever I take out the exhaust valves that there is a small amount of gum on the stems, and it has occurred to me that perhaps the gum has retarded the closing of the valves to such an extent that the exhaust is in contact with them a longer time than would otherwise be the case, and that this might cause an undue formation of carbon on the seats. The valve springs appear to have lost none of their strength, although I have no way of determining that accurately. The inlet valves are in good shape all the time and require practically no attention.

The carbon which accumulates on the top side and underneath side of the valves is sometimes soft and sooty, but at other times it is hard and chips off readily. The same is true of the carbon which accumulates in the engine. The carbon on the valve faces is, in most cases, very hard and smooth and cannot be chipped off.

The amount of carbon which accumulates in the cylinders does not appear to be excessive.

Last year I wrote to the manufacturer of my car telling him of my difficulty and he advised me to cut off the ends of the pins on the connecting-rods, so that they would dip into the oil not more than 3-32 of an inch. I did this, but without any result whatever.

Do you think that the trouble would be remedied by putting in Leak-Proof rings in the place of the top rings on each piston? Do you think the trouble would be remedied by putting in new valves with stems that fit more accurately? Of course, the guides would have to be reamed and valves with larger stems than the old ones used.

Owensboro, Ky. F. S. BRANNON.

—If the trouble is caused by an excess of oil making its way up into the combustion chambers, then Leak-Proof rings should eliminate this, unless the cylinders are badly worn.

Reaming out the valve stem guides and putting in new valves to fit would not improve the operation of the motor. It might help, however, to clean the gummed oil off the valve stems.

It is difficult to say just what is causing your valves to carbonize as, apparently, you have done all the things that might possibly remedy such a trouble. Therefore, it seems best to first state what might cause the carbonization of the valves.

The formation of carbon and the pitting of the valves may be produced by an excess of oil which in turn may be due to worn rings, loose pistons, or scored cylinders, too long connecting-rod scoops, too high an oil level in the crankcase, or to the use of too light an oil. This trouble may also be caused by too rich a mixture or the improper seating of the valves, the latter being produced by careless grinding, improper adjustment of the valve tappets or possibly to high spots on the cams. Deposited carbon in the cylinders might also cause this difficulty.

Make sure that your pistons are not badly worn, and loose, and that the cylinder surfaces are in good condition. Also see to it that the openings in the rings are not in a vertical line, as this would allow a certain amount of leakage.

Then remove the carbon from the cylinders by the use of oxygen, by scraping, or the use of some compound. Do not use kerosene or alcohol, as these liquids will not remove incrusted carbon completely. After this has been done, grind the valves with coarse emery paste until all the pits in both valves and seats have disappeared and then polish these surfaces with fine emery paste.

After doing this start the motor and when it is thoroughly warm adjust the push-rods so that there is enough clearance between valve stem and push rod to allow the insertion of a sheet of writing paper. Then test the compression on each cylinder in turn and if any cylinders are found weak increase the clearance between the valve stem and push rod on the exhaust side and, then, if this does not improve the compression, do the same on the inlet side. The reason for doing this is that the valves may be held open slightly longer than they should because of high spots on the backs of the cams. If there were such a high spot on one or more of the exhaust valves, for instance, the result would be a certain amount of leakage through the valve that might cause the valve to become carbonized. A high spot on one of the inlet cams merely shows what is causing the loss of compression in that cylinder.

How To Care for Westinghouse System

Editor THE AUTOMOBILE:—Will you please explain in detail the method of caring for the Westinghouse starting and lighting system used on the Hupmobile 32?

New York City. H. S. R.

—The starting and lighting system used on the Hupmobile is of the Westinghouse, two-unit type, one unit, the starting motor, being located on the side of the power plant, Fig. 4, and the other unit, the lighting generator, above the crankcase on the right side of the motor.

The commutator and brushes of the starting motor should be examined occasionally so as to keep the commutator free from dirt and oil. When the commutator is dirty wipe it off with a piece of cloth and under no circumstances use waste. When the commutator and brushes are in good condition they will show a glaze and the commutator will be a chocolate brown color. If the commutator should become roughened it should be smoothed with fine sandpaper. Do not use emery paper. In general the brushes should not be disturbed as long as the motor operates properly.

The brushes of the lighting generator should be examined occasionally to see if they are clean and free from dirt and are smooth.

When trouble occurs in the lighting system ordinarily it will be found to be due to a blown out fuse, an accidental ground or short-circuit, loose contacts, battery disconnected or accidentally run down, or burnt out lamps.

Occasionally examine the cutout switch of the generator to see if it is properly disconnecting the generator circuit from the ground. This switch should be in the open position when the motor is stopped and should be closed, or down, when the motor is running at a speed corresponding to 6 or 7 miles per hour or better.

Should the starting motor refuse to work the most probable trouble is a run-down battery, a short-circuit or ground in this wiring, or dirt, oil or water in the starting switch. The latter is easily remedied by removing the cap or cover from the rear end of the starting switch and cleaning the interior out thoroughly, so that the copper ring and the preliminary contact points and all other parts are clean oil and water.

Power Wasted by Muffler Negligible

Editor THE AUTOMOBILE:—1—Will you please explain if an average automobile or motor will develop more power with a cutout on or not, and why? Will the average automobile gain speed by putting cutout on?

2—Can you tell me whether or not a motor will heat up less with the cutout on?

Pigeon, Mich. W. F. BRODERICK.

—1—Fitting a muffler cutout will not increase the power of a motor appreciably at ordinary speeds although it does make a little more difference at high speeds. There is a popular misconception concerning the efficacy of the muffler cutout, but the fact of the matter is that mufflers are designed to give a very small back pressure at ordinary car speeds and therefore as far as increasing the power is concerned they are nearly useless.

This can quickly be demonstrated by setting the throttle of a car in a certain position on a level road and then noting if any increase of speed is registered when the cutout is opened.

Several tests have been made to determine how much power is consumed by the muffler and the results of two of these will be given as illustrations.

Fig. 5 shows the result of testing a six-cylinder Pierce-Arrow motor at the Automobile Club of America's laboratory in the summer of 1912. The curve indicates that for a speed of 700 revolutions per minute, which corresponds roughly to a car speed of 20 to 25 miles per hour, the back pressure is just 1 pound. Assuming that the mean effective pressure on the explosion stroke is 90 pounds per square inch, when the throttle is wide open, it is seen that for all ordinary car speeds the loss due to the muffler is not much over 1 per cent. with the throttle wide open and with the throttle partly open, the loss is correspondingly less.

Even with the motor running at 1,800 revolutions per minute, the back pressure is only 3 pounds or 3.3 per cent., and at this speed such a loss is not important except on racing cars.

Another interesting test was run in April, 1912, by the Packard Motor Car Co., Detroit, Mich., on one of its 30-horsepower motors to determine the power lost in the muffler in connection with the agitation at that time in favor of the abolition of the muffler cutout and the results are given in a set of curves in Fig. 6.

The power curve labeled 1 represents the results attained with the muffler attached to the motor, curve 2 is taken with a straight 3-inch pipe, 7 feet long, and curve 3 is taken with the muffler detached from the line altogether. The upper curves in the diagram show the calculated mean effective pressures corresponding to the horsepowers developed in curves 1, 2 and 3.

From this curve it can be seen that the average difference in power gained by removing the muffler varies from 2.75 to 1.12 horsepower. The removal of the muffler gives the same results as a cutout having an efficiency of 100 per cent. The differences in power caused by using the cutout will be even less than those shown in the curves.

However, the muffler cutout has several small advantages that more than justify its existence. It is of use in telling whether or not the motor is running properly on all its cylinders, and this is a desirable feature because it is impossible for the operator to distinctly hear the exhaust from a good muffler when running along the road. Then again, the muffler cutout is invaluable as a warning signal. People will hear this noise when any other kind of warning will pass unheeded. Last, but not least, the unmuffled sound of a well-running motor is very pleasant to the ears of most motorists and this alone is sufficient excuse for its use, provided that the motorist does not use the device in towns or cities where the noise would be a nuisance.

2—Since the muffler takes so little power it will not cause the motor to overheat.

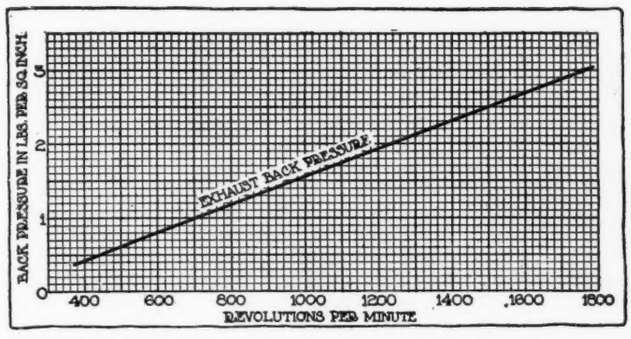


Fig. 5—Exhaust back pressure curve for Pierce-Arrow

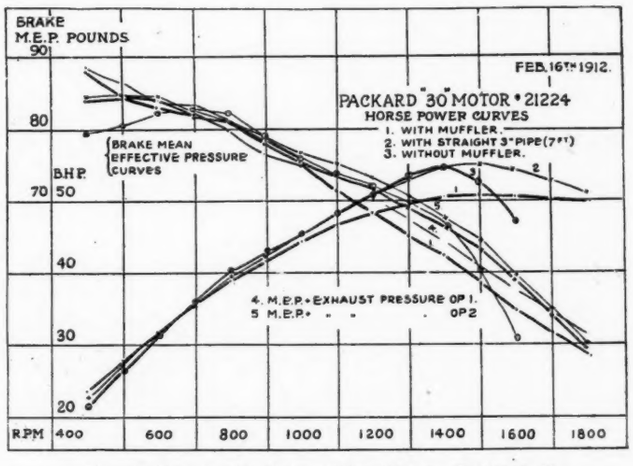


Fig. 6—Curves showing muffler loss on Packard 30

The Engineering Digest

Universal Search for Better Springs—A New Design of Progressive Type Favorably Received Abroad

NEW MISSION OF RACING: TO DEVELOP AND DEMONSTRATE BEST SPRING SYSTEM FOR ALL MOTOR VEHICLES

NO mechanical feature of automobiles is more elusive to exact reasoning than the spring suspension, partly because spring action and spring metallurgy in themselves are difficult subjects and partly because the variable vehicle speed, the variable loads and the incalculable succession of inequalities of the average road produce a maze of variations in the conditions which the springs have to meet, an intricacy further complicated by the important relations between the weight of the running-gear, on one side, and that of the spring-suspended portions, on the other side, whose irregular movements, vertically, longitudinally and laterally, it is the object of the spring suspension to reduce to a minimum and also to tone down to such softness that no sharp jerks or vibrations are experienced.

In animal locomotion a percentage of the work expended in the absorption and avoidance of shock is perhaps converted, by reaction of the springy elements, into an aid for propulsion, but in motor vehicles the sum total of momentum represented in all the shocks received comes out of the motor power, as no springs have been devised which will return any portion of the work stored in them in a useful manner. Action and reaction both make for discomfort and strains of materials.

Spring System Vital in Road Races

In automobile racing it is coming to be understood that it is in reality the relative merits of the spring suspensions of the competing cars by which the races are decided, since the motors as a rule are quite capable of driving the cars much faster than they are actually driven, and the only thing which restrains drivers, while also reducing the net motor power, is the shocks received, with the sense of danger for man and mechanism which they imply. The high speeds reached on exceptionally smooth tracks, as those of Brooklands and the Florida beach course, permit no other inference than that the spring supension, considered broadly as including all the other features which influence it—such as weight distribution and weight of running-gear—is the deciding factor in racing nowadays and that refinements of the motor and robustness of the tire equipment derive their importance mainly from the varying degree in which different motors and different tires are adapted for resisting the deteriorating effects of the road shocks.

This viewpoint, to the effect that more is gained, for favorable racing results, by reducing the road shocks by all available means than could possibly be gained by coupling the most excellent improvements in other directions with an indifferent spring suspension, has been referred to vaguely in the French press a number of times during the past two or three years in connection with the construction of Peugeot and Delage racing cars but has not been made very prominent, although a general understanding of it would bring racing again into the closest possible connection with the construction of ordinary cars and popular interests.

The difficulty of the subject, in a technical way, has also greatly restricted the discussion and confined knowledge of the widespread European movement for the improvement of spring suspensions to rather narrow circles. The immense variety of shock absorbers, rebound checks, auxiliary springs, the different types of cantilever springs, the Bugatti springs and the number of combinations of leaf springs with coil springs, which have cropped out experimentally here and there, show the growth of the movement, however, and the great interest taken in these departures from standard construction, as well as in the published accounts of experiments by Lanchester in England and Bobeth in Germany, indicates perhaps that wholly satisfactory solutions of the spring problem have not yet been reached. It is felt as a void in the development, for example, that springs equally well adapted for supporting a light load and a heavy load, for resisting a light shock and a heavy shock, still have found no place in the market.

The Field for Progressive Springs

Singling out this phase of the subject the Technical Committee of the Automobile Club of France finds occasion to call the attention of the French industry and motorists, through its monthly bulletin, to the latest effort at producing a practicable spring suspension of the progressive type referred to. The brief article does not take notice of the field in which the spring with progressive resistance to loads and shocks is usually supposed to be most urgently required; namely, that of commercial vehicles, delivery wagons, trucks and omnibuses, which are operated with greatly varying loads and do not as a rule receive the benefit of pneumatic tires, but it reflects the current opinion among engineers with regard to the need of such springs for ordinary automobiles, in the operation of which the loads are not varied so much, while, on the other hand, the severity of shocks is varied over a wide range by reason of the high speeds at which they are driven. The requirements due to this factor and the emphasis laid on comfort in all pleasure vehicles combine perhaps to make improvements of their spring suspension as important industrially and commercially as in the case of the heavier and slower class of vehicles. The article reads in substance as follows:

The Serrell Spring Suspension

Since the beginning of the automobile industry designers have been searching for some way of adapting to the standard chassis a spring suspension with a flexibility decreasing with increasing loads.

If a chassis is equipped with very flexible springs the suspension is excellent for light loads and smooth roads, but the oscillations become rapidly excessive when the load is in-

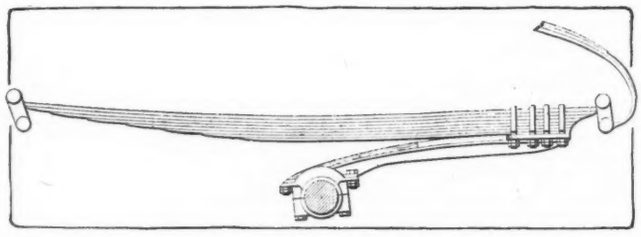


Fig. 1—Serrell progressive spring for variable loads and speeds

creased and especially under road shocks. With less flexible springs, on the other hand, the suspension becomes faulty for light loads and fails to compensate for the ordinary road inequalities. A spring affording all the required action under light loads and yet supporting heavy loads and heavy shocks without excessive deformations seems thus absolutely desirable. Many attempts in this direction have already been made and numerous inventions have been proposed, and yet, up to this day, it seems that no definite results have been achieved, considering that leaf springs of constant flexibility remain in general use on the chassis of automobiles.

A new solution of this problem is now presented in the applications made by Mr. de Camaret of the designs patented by Edward William Serrell, and this solution seems rather felicitous. It rests on the fact that the flexibility of a leaf-spring is proportionate to its length and that the load required for breaking the spring, on the other hand, grows in inverse proportion to its length.

Serrell's first conception was to hold the middle portion of an ordinary semi-elliptic spring between two rigid shapes of suitable curvatures. The spring, when it was bent away from its rest-position, gradually came to lean more and more against this support as the compression increased and the shape of the middle portion of the spring approached more and more to that of the rigid shape underneath it. The upper shape similarly graduated the resistance to extension of the spring.

However, the form of the rigid shape—called the cradle by the inventor—proved very difficult to determine. Insignificant

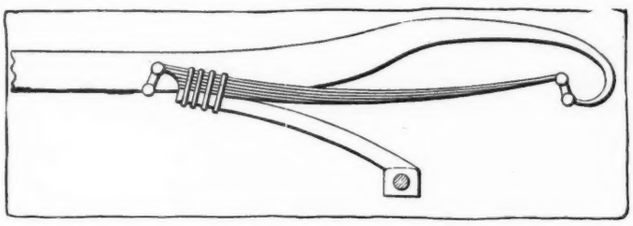


Fig. 2—Latest design of Serrell progressive spring suspension

variations of its profile produced sometimes unexpected differences in the flexibility. It was found, in fact, that this profile had to be modified considerably according to the class, weight and dimensions of the vehicle and according to its normal loads and speeds. Serious difficulties in the application of the idea arose from this peculiarity. It was also an objection that the unsuspended weight was appreciably increased by the addition of the rigid shapes.

Another consideration was that the weight of the bodies which will be used with the different chassis of the same manufacturing series are unknown to the maker of the chassis [the custom of having bodies specially made being still common in Europe, notably in France.—ED.] and that the possibility of regulating the springs provided by the chassis-maker to the actual load therefore seemed very desirable.

In order to meet these diverse needs Mr. Serrell found occasion to take out an additional patent and to limit his system to the use of quarter springs shackled to the frame reaches at both ends on the plan indicated in Figs. 1 and 2, of which the latter represents the latest development. The cradle or rocker arm is strongly clipped to the thickest part of the leaf spring and at its other end is journaled upon the vehicle axle.

When a shock or an increase of load makes the axle approach the chassis, the leaf spring bends but at the same time develops itself upon the curve of the rocker arm, thereby reducing the length subject to further flexion. The flexibility is thus reduced automatically.

Various advantages of this arrangement are at once ap-

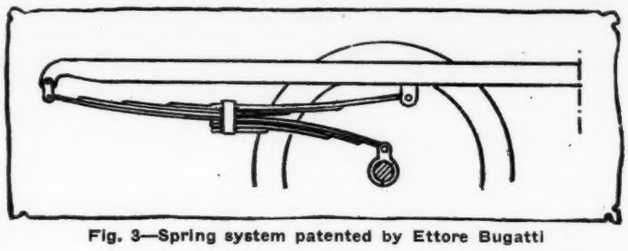


Fig. 3—Spring system patented by Ettore Bugatti

parent: (1) the spring can have a much greater length for a given available space and can therefore be infinitely more flexible, (2) in case of shock upon the axle, the mass of the spring and of the rocker arm tends by its inertia to absorb the axle movement, while with ordinary springs the thickest portion remains integral with the axle and shares its velocity of movement.

It is true that such springs do not seem suited for transmitting the driving-thrust from the rear wheels to the chassis, as now more and more required with shaft drive, but the inventor has studied this question and believes he can realize an acceptable solution by reversing the direction of the spring. [This refers apparently to the arrangement shown in Fig. 2.—ED.]

Mr. de Camaret has applied this suspension system to a Rochet-Schneider car of 12 horsepowers weighing 1,200 kilograms, and the results are, according to those who have tried the vehicle, absolutely satisfactory. The system seems therefore well suited for engaging the attention of manufacturers, and I consider that it would be greatly to their interest to try it.—G. Leroux in *Bulletin Officiel* for March.

Comments on the Serrell System

[The rocker arm principle for varying the action of a spring according to the stress placed upon it is by no means new but is embodied in two or three American patents for improvements of springs for railway cars. But the rocker arm in these cases serves to vary the length of a lever by which the coil springs are compressed, by changing the location of a fulcrum. The curve interacts with a surface which is rigid and unvarying, and the action produced does not depend upon the exact curvature taken under stress by the least flexible portion of a leaf spring, as in the application of the same principle adopted by Serrell. Evidently the greatest accuracy in the original curvature of the spring must be required in order to secure predetermined effects and avoid experimental reshaping of the profile of the rocker arm in each case of application to a car, and the slightest subsequent "set" of the spring must change the results considerably, so that the use of spring material of the very highest grade, by the use of which any permanent set perhaps can be avoided, must be necessary.

The extreme sensitiveness of the system is indicated by the use of shackles at both ends of the spring, which arrangement is apparently necessary to avoid a jerky action of the wheel in relation to its contact with the road as well as certain irregularities in the spring action which would evidently follow if the spring were tilted because only one end of it could adjust itself to the conditions. And with shackles at both ends a radius rod or driving-strut is perhaps, after all, an indispensable feature of the mechanism, even though it is hoped that the design shown in Fig. 2 might serve without such a strut.

The plan shown in Fig. 1, which seems to be the one which has been tried, has the advantage over that of Fig. 2 in that it permits the use of a very long spring without interfering with the normal relations of the axle to the rear portion of the vehicle frame or shortening the wheel base, but the progressive effect due to the spring's conforming with the curvature of the rocker profile is reduced by the fact that the C-spring does not share in this action. It serves the pur-

pose, however, of toning down the suddenness of the stresses to which the clips are subject. On the plan of Fig. 2 these stresses must be enormous and incessant, since every road shock is transmitted first to these clips and is multiplied in severity by the leverage of the rocker arm, almost unmitigated by any spring action.

Short Life Likely

The most fundamental shortcoming of the rocker arm system, as here applied, lies, however, in its conflict with accepted rules for spring designs, according to which the amount of spring material engaged in the absorption of a shock should be in proportion to the severity of the shock in order to secure long life of the spring. In the Serrell design increased load reduces the active length of the spring, and the more severe shocks received under this condition have to be absorbed in a correspondingly diminished amount of material. The only remedy for this shortcoming lies in making the spring so long and heavy that the material remaining in action even when the active length is reduced to its minimum is sufficient for the severest shocks. As the length of the rigid rocker arm cannot be increased beyond certain limits, the lengthening of the spring would, on the plan of Fig. 2, interfere with the general design of the vehicle by rendering it necessary to move the rear axle forward. Fig. 1 seems in this respect more promising.

Comparison with Bugatti Spring

At this point a comparison with a design patented by Ettore Bugatti and shown approximately in Fig. 3 (reproduced from page 560 in THE AUTOMOBILE of March 5) also suggests itself. While few details are at hand with regard to this design, it would seem that the main leaf of the quarter spring in it, which takes the place of the rocker arm in the Serrell design, must be comparatively rigid, since the shorter leaves are shown as underneath it, where they can only serve the purpose of a rebound-check. In action, this quarter spring will of course flatten out somewhat and conform to some extent with the adjacent surface of the main spring, and some progressivity in the spring resistance will be the result. But, as may be noticed in Fig. 3, the two sides of the main spring are arranged to be bent in opposite directions, so as to form an S-curve when the axle is forced upward, and this twist of the middle portion of the spring permits the wheel to ride over obstacles in the road with less flexion of the spring material than would otherwise be necessary, the twisting serving the same end in this respect as the pivotal mounting of a cantilever spring.—ED.]

Another Check for the Differentials When They Misbehave

RESULTS accomplished by Romeiser by placing a strong spring-actuated brake inside of the differential, in an omnibus in one case and in a military truck in another case, were related in THE AUTOMOBILE of last week. A much more ingenious construction for the same purpose has been devised by Christopher G. Eden of England, but it is not reported that it has been tried and found acceptable and, as it is supposed to work on the hydraulic principle and with reciprocating pistons in a rather small space and with occasional high pressures, it is difficult to imagine that it can operate long before getting out of order by leakage. The construction, which is shown in Fig. 4, points nevertheless toward new methods which in the end may prove successful and is therefore interesting. It is described as follows:

The usual 2 pairs of bevel-gear pinions are employed, and from the inner ends of those pinions, AA, whose shafts are journaled in the casing eccentric stub shafts *aa*, carrying rollers, are extended toward the center of the mechanism, so that the two stub shafts in conjunction form a sort of crankshaft, interrupted at the middle, by means of which the two connected pistons BB are reciprocated, when pinions A are rotated on their shafts, in the cylindrical bores C formed in the central portions of the two driven bevel-gear pinions.

These bores are of course filled with oil. Ordinarily, when the car is merely turning a corner and the differential is acting within its purpose, the slow reciprocation of the pistons only transfers oil from one pump bore to the other and back again without great resistance, through the connecting tube. But in this tube there is placed a double valve comprising a stem with a mushroom D at each end and two springs whose normal tension, acting against an abutment in the middle of the tube, holds both valves away from the tube ends, so that the oil can flow in either direction. A strong flow, on the other hand, caused by rapid rotation of pinions A, overcomes the spring tension and makes one of the valves close the tube; and then, the passage of oil being barred, the pinions A are prevented from rotating so long as the pressure upon the oil is superior to the spring tension; that is, so long as the resistances to movement of the two driving-wheels of the vehicle vary too greatly.—From *Omnia*, June 6.

Luminous Bar to Take the Place of Glaring Headlights

AN entirely new principle for road illumination is proposed by a French firm with a view to eliminating the offensive glare of headlights and yet maintain a sufficient illumination of the road ahead. It takes the form of a bar in which are mounted 12 small electric lamps with projectors.

The basic idea for this innovation is that a line of light is not blinding, while a strong light concentrated at one point, or two points some distance apart, produces the blinding effect by reason of the sharp contrast with the obscurity surrounding it.

The Auster Luminous Bar in which this idea is realized is about 4 inches wide and as long as the wind shield is broad. It is journaled at its ends in two rods which contain the electric wiring, and these rods may be secured to the windshield frame in such manner that the row of lights can be turned either to a high position at the top line of the shield or to a lower position just over the dashboard. The bar can also be mounted in front of the top of the radiator. For city driving only the two end lamps of the row need to be lighted, and the device thus is intended to take the place not only of headlights but also of the side lamps.—from *Omnia*, June 6.

Lighter Trucks for German Army

HERETOFORE the Prussian army administration has wanted for military transportation work only motor trucks capable of carrying a payload of 5 to 6 tons, and only trucks of this size were subsidized. In commerce, however, the 3-ton truck is much preferred and is considered more economical and practical for all-around work. Mainly for this reason, and so as to create a wider demand for the army type of truck, the subsidy plan has now been extended to 30-horsepower, 3-ton trucks capable of a speed of 30 kilometers per hour.

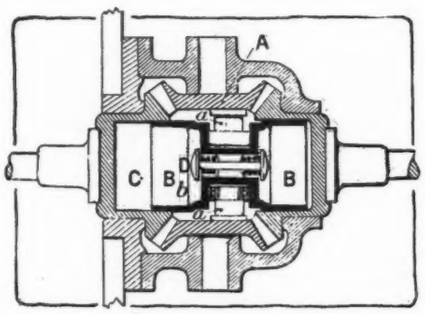


Fig. 4—The Eden Differential Check

Among the New Books

Works Include the Autocar Year Book, Gear Cutting, Engineers' Costs and Touring in France

PROBABLY the most interesting book from the general reader's point of view is the Autocar Imperial Year Book, which is a résumé of the important developments in English motoring during the past year. A book that will appeal to the foreign tourist is one entitled, The Ideal Motor Tour in France. Two books of importance to the engineer are Gear Cutting and Engineers' Costs. The former is an up-to-date work on gear cutting and the latter a complete consideration of the economics of machinery manufacture.

THE AUTOCAR IMPERIAL YEAR BOOK, 1914. Published annually by Iliffe & Sons, London, England. 130 pages; cloth; with illustrations and tables.

The aim of this publication is to put into convenient form for the benefit of readers outside of England a volume of information on current motor subjects that will keep them abreast of the times.

The book is a review of the most interesting and important happenings of the year, and the volume is begun in a fitting manner by an article entitled, the Modern Chassis; Tendencies of Design, in which the developments of the year and their bearing on future practice is discussed. Another chapter takes up the light car situation and there are others on electric starting and lighting and similar pertinent subjects.

At the end of the book several pages are devoted to the racing records of the year.

THE IDEAL MOTOR TOUR IN FRANCE. By Walter Hale. Dodd, Mead & Co., New York City. Liberally illustrated; 300 pages; cloth; $1.50 net.

Written by a man that has motored over the roads of Europe for the past 9 years, this book may well be considered the motorists' Baedeker for France, because it gives a mine of information about places of interest, hotels, roads, garages, licenses, costs, etc.

Starting at Havre, the Ideal Motor Trip leads to Paris, thence southwest through Bordeaux, Biarritz, the Pyrenees, thence in a great curve through the Carcassonne, Avignon, the Riviera, across the Alps to Aix-Les-Bains, through the Vosges and back to Paris.

ENGINEERS' COSTS AND ECONOMICAL WORKSHOP PRODUCTION. By Dempster Smith and Philip C. N. Pickworth. Emmott & Co., Limited, Manchester, England. Cloth; 247 pages with tables and curves; 4/6 net.

An endeavor has been made to give in a clear and simple manner the principles of engineers' costs, together with the various problems and methods of solution arising in this connection. The close relation between accuracy in costing and economy in workshop has been kept continuously in view and the subject has been treated from the engineer's standpoint rather than the accountant's.

At the outset the cost of material is considered and then following this there is a chapter on shop organization and management. The subject of wage systems is given a chapter and then follows several chapters on considerations affecting times for machine operation. Many interesting curves are given. For instance the relation between cutting speed and area of cut for various grades of cast iron are shown as well as similar curves for steel.

Succeeding chapters consider the standard times for hand operations such as filing, inspection of work and classes of fit; establishment charges; maintenance and selling expense.

GEAR CUTTING IN THEORY AND PRACTICE. By Joseph Horner. Emmott & Co., Limited, Manchester, England. Cloth; 390 pages with half-tones and line cuts; cloth; 7/6 net.

The object of this work, to use the author's own words, is: "To cover all the later developments in gear cutting in a reasonably comprehensive manner. Many books have been written on the subject of gears dealing with the designs of teeth and giving some account of the shop practice connected with the formation of tooth shapes, but either theory is treated apart from practice or the work of the shop is dealt with in too summary fashion."

The book is divided up into four sections: the first taking up the principles of design; the second, the methods of gear cutting; the third, machines, and the fourth the strength of materials and the methods of manufacture.

Under the first heading the elements of tooth forms, tooth curves, pitches, tooth proportions, spur, spiral and bevel gears, are considered. The second division takes up form cutters, form planing and generating methods.

In the third part, the various types of machines using form cutters, are described, as well as the machines that generate by planing, hobbing, and milling tools.

The last section is devoted to the manufacture of gears and the strength of gears.

INSTRUCTIONS OF OXY-ACETYLENE WELDING AND CUTTING. The Vulcan Process Co., Cincinnati, O. 83 pages with liberal illustrations; cloth, $1.

While this book has been prepared by a manufacturer of welding and cutting apparatus it contains much valuable matter and is free from any reference to the company's product except for two or three illustrations at the front of the book.

Calcium carbide from which acetylene is made is first described, its physical and chemical properties are told and the care and use of the substance explained.

The generation of acetylene gas and the four types of generators: the drip, flooding, dipping and carbide-to-water are described.

Oxygen gas and its manufacture is the next subject and then hydrogen is similarly considered. Following this the structure of the oxy-acetylene flame is discussed and its structure illustrated.

From thence the reader passes on to a description, with complete illustrations, of the methods of handling the torch when welding; both low and high pressure torches are described and the method of using them explained.

The next subject is pressure regulators and following this is a chapter on preheating the metal before welding.

Complete instructions on welding are given, the various types of joints are described and illustrated and their relative merits discussed. The special treatment required by the different metals such as steel, brass, bronze and aluminum are related.

Welding rods and fluxes, metals and their properties and the removal of carbon from the cylinders by the use of oxygen are the headings of the closing chapters.

VANDEGRIFT'S DIGEST OF THE UNITED STATES TARIFF ACT, 1913. For sale by F. B. Vandegrift & Co., New York City; 182 pages; paper cover; 50 cents.

This book is a pocket edition of the United States Tariff act, as passed by Congress, Oct. 3, 1913, together with a schedule of articles, revised to January 1, with rate of duty and paragraph of law. In addition the Customs Administrative Act as amended by the above act is given. At the end of the book there is a complete schedule of duties.

The Automobile

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Beyond the Horizon

THOUGH great good has been accomplished by the Society of Automobile Engineers in its short history, considering that this period has been a period of great development in the automobile, yet the work of the society is but started and its greatest achievements are yet beyond the horizon.

Vice-President Zimmerschied in his article in this issue dealing with the future possibilities of the society places greatest importance on the education of the young graduates in our colleges and technical schools, those persons who, while in the student ranks to-day, will be the designers of to-morrow. If our engineering profession is to make that progress which our industry warrants then our boys must be schooled to meet such requirements.

To-day we have educational institutions that feature certain engineering courses, representative of professions that are not so important to-day as the automobile problem. These minor and older industries have in years past got the ear of the universities and to-day our society can accomplish similar equipment for our students who have in mind a future worked out in the automobile world.

Engineers to-day are needed in the automobile industry in more capacities than merely that of determining safety factors in materials or car parts. Our great motor truck industry is marking time because of lack of men adequate to push it forward at the pace it should go. Here we need industrial engineers, or transportation engineers, if the term may be so used.

Many heads of old established industries to-day acknowledge that they do not actually know what horse systems have cost them, although they have been using such for perhaps half a century or longer. In a general way they have a vague conception of what their individual transportation has cost but beyond this they have not definite facts, and it devolves on the shoulders of our engineers of to-day to thoroughly analyze their figures extending perhaps over the last 10 years and show exactly what horse transportation has cost.

Subjects of this nature were vital topics with our society some years ago, but they have been dropped more or less during the past season or so and it would seem that no time is more opportune than the present when this aspect of automobile engineering should be a pertinent topic for discussion. Our society should take a broad, very broad, survey of the entire automobile industry and keep before the attention of its members, both for discussion and research, those topics that are most in the crucible of financial or business circles.

During the past season the cyclecar movement has been on the lips of everyone, and everyone has been asking what will be the outcome of the movement. Our society should have a standing committee on a subject of such importance, and this committee might be commissioned with certain research work, which would be proof conclusive that the society was in the front rank, even in new departments of the industry.

Considerable vacillating has been done in connection with many of the engineering factors entering into cyclecar construction, and early action on the part of a research committee of the society in this work might have exerted a very stabilizing influence on the industry and the public at large, a situation very much desired.

The present officers deserve the heartiest congratulations on the excellent work that is being done with the standards committee and the quarterly sessions of this committee will have a very salutary effect on the work. Committee work is the life-blood of any society and the new financing that has been carried out during the past 6 months for the direct benefit of this committee stands as one of the milestones of the present year's accomplishment.

Too often the car owner is not aware of the value the S. A. E. is to him, and his interest in the direct work of the society is not so great as the society deserves. Every car owner and every truck owner has benefited directly by the work of the society since its inception and the society should not fail to make use of every opportunity to keep its activities well before the public. The public is to-day more interested in matters pertaining to engineering questions than ever before.

The use of moving pictures and the stereopticon can be introduced into the meetings of the society to great advantage. Quite frequently a very competent engineer fails to convey his argument to his auditors and every device whereby greater interest will be

added to the sessions of the society should be introduced. Keeping in step with public forces is a great factor for success. It makes work easy, it magnetizes the people. Papers that are long mathematical dissertations can be made to bubble with interest if supplemented with the stereopticon slide or the moving picture.

In future annual mid-summer sessions of the society it would be ideal if an evening could be given over to a lecture by one of the greatest scientists of the age. His topic might not be directly connected with the automobile, but might have an indirect bearing from many viewpoints. Such a lecture would do much to elevate the status of the society and there would be inspiration to every auditor in it. Pure engineering must not be lost sight of in the activities of a growing engineering society. Too often engineering as directly applied to the industry in question receives every attention. Applied engineering has done valiant service but do not overlook the discussion of engineering problems from a purely scientific viewpoint.

Michigan Has 89,413 Men Employed in the Automobile Industry

DETROIT, MICH., June 18—According to the annual report of the Department of Labor of the State of Michigan, covering factory statistics for 1912, the total number of employees in 10,597 factories was 404,480, and out of this total, as nearly as the records at hand would permit, 89,413 employees were employed in automobile plants, motor car parts and accessories manufacturing concerns, garages, repair stations, in one word, were connected in some way with the automobile industry. The number of these establishments is 518, of which 248 are in Detroit.

Many changes have occurred in the industry since 1912, and factories which then were on the records have since been absorbed by others, have failed or have undergone some other changes which make them no longer a part of the industry to which they once belonged. For instance, there were then thirty-four motor car builders in Detroit, of which six have gone out of business, four have changed hands and one has become a motor car parts manufacturing concern. In those thirty-four plants a total of 36,741 men and 859 women, or, all told, 37,590 people, were employed in 1912. The largest number were at the Ford Motor Co., 7,317; Packard is second on the list with 6,603 employees; Cadillac, third, with 4,884; Studebaker, fourth, with 3,471; Chalmers, fifth, with 2,844; E. M. F., now one of the Studebaker plants, was sixth on the records with a total of 2,753 men; then came the Northway Motor & Mfg. Co.; Hudson; R-C-H; Hupp; Lozier; Flanders plant, now one of the Maxwell plants; Anderson; Abbott, etc.

In the state, outside of Detroit, there were then thirty-two motor car plants, of which eight are now out of business or have changed ownership. The Buick plant in Flint had the largest number of employees, 5,411. Then came Reo concern with a total of 1,835 for its pleasure vehicle and motor truck plants, while Olds was credited with 1,033 men. All told, the records for the state plants showed 12,697 men and 530 women, or a total of 13,237 employees.

Thus in 1912 a total of 50,827 men and women were employed in sixty-six automobile manufacturing concerns in Michigan, or nearly 57 per cent. of the total number of employees in all plants connected with the automobile industry.

From the state records for the years 1909, 1910, 1911 and 1912 there were respectively 3,270, 3,469, 5,426 and 4,884 men at the Cadillac plant; 1,692, 2,593, 3,593 and 7,317 at the Ford plant; 3,107, 4,637, 6,410 and 6,603 at the Packard plant and 1,232, 5,744, 6,613 and 6,224 at the Studebaker plant. The records for 1910, 1911 and 1912 show respectively 60, 446 and 465 men at the Abbott plant; 399, 615 and 867 at the Hupp plant; 123, 347 and 383 at the Krit plant; 510, 760 and 1,391 at the Hudson plant; 27, 106 and 128 at the Paige-Detroit plant; 13, 55 and 101 at the Federal plant; 267, 408 and 589 at the Anderson plant.

The number of employees at some of the parts and accessories manufacturing plants in 1912 was as follows, according to the official records: Weston-Mott Co., Flint, Mich., 2,151; Continental Motor Mfg. Co., Muskegon, 1,162, and 741 in Detroit; Dodge Bros., Detroit, 1,872; Fischer Body Co., Detroit, 1,271; Timken-Detroit, 1,119; Hayes Wheel Co., Jackson, 467; Lewis Spring & Axle Co., Jackson 547; Michigan Motor Castings Co., Flint, 326; McCord Mfg. Co., Detroit, 836; Briscoe Mfg. Co., Detroit, 768; Hayes Mfg. Co., Detroit, 761; Michigan Steel Castings Co., Detroit, 243; Aluminum Castings Co., Detroit, 545; Detroit Steel Products Co., 458, and the Jos. N. Smith, Detroit, 300.

Total number of establishments canvassed in 1912	10,597
Total number of establishments canvassed in 1911	9,456
Total number of all employees in 1912	404,480
Total number of all employees in 1911	359,752
Total number of men at general factory work in 1912	304,738
Total number of men at general factory work in 1911	269,492
Total number of women at general factory work in 1912	48,475
Total number of women at general factory work in 1911	44,398
Total number of boys between 14 and 16 in 1912	2,457
Total number of boys between 14 and 16 in 1911	1,995
Total number of girls between 14 and 16 in 1912	1,502
Total number of girls between 14 and 16 in 1911	1,456
Total number of superintendents in 1912	11,353
Total number of superintendents in 1911	10,056
Total number of foremen in 1912	11,917
Total number of foremen in 1911	11,284
Total number of men at office work in 1912	14,407
Total number of men at office work in 1911	12,692
Total number of women at office work in 1912	9,631
Total number of women at office work in 1911	8,449
Aggregate daily wages paid all employees in 1912	$913,376
Aggregate daily wages paid all employees in 1911	784,108
Average daily wages of factory men in 1912	$2.37
Average daily wages of factory men in 1911	2.32
Average daily wages of factory women in 1912	$1.32
Average daily wages of factory women in 1911	1.24
Average daily wages of boys in 1912	$1.09
Average daily wages of boys in 1911	.91
Average daily wages of girls in 1912	$ .88
Average daily wages of girls in 1911	.88
Average daily wages of superintendents in 1912	$5.33
Average daily wages of superintendents in 1911	5.25
Average daily wages of foremen in 1912	$3.73
Average daily wages of foremen in 1911	3.56
Average daily wages of all employees in 1912	$2.31
Average daily wages of all employees in 1911	2.23
Average number of hours worked per day in 1912	8.5
Average number of hours worked per day in 1911	9.5
Average number of days worked per month in 1912	26.7
Average number of days worked per month in 1911	25.5
Average number of months worked in 1912	11.6
Average number of months worked in 1911	11.6
Total number of all employees connected with the automobile industry in the State of Michigan in 1912	89,413
Total number of all employees in 66 automobile manufacturing plants in 1912	50,827
Total number of men employed in these 66 automobile plants in 1912	49,438
Total number of women employed in these 66 automobile plants in 1912	1,389
Total number of employees in 34 automobile plants in Detroit in 1912	37,590
Total number of men employed in these 34 plants in 1912	36,741
Total number of women employed in these 34 plants in 1912	859

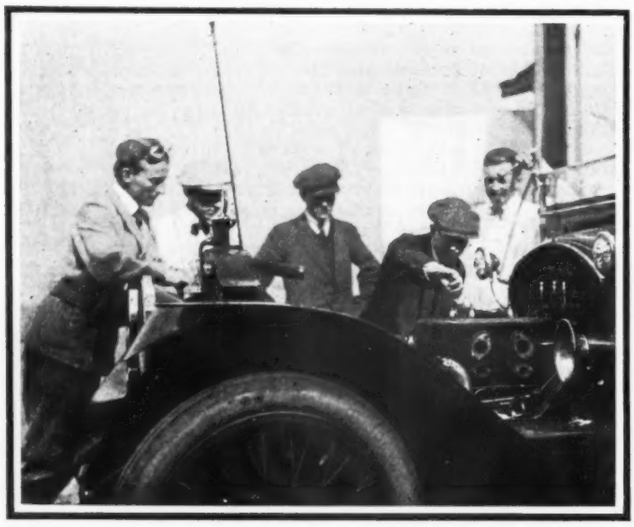
Packard Stock Touring Car Makes 70 Miles in 1 Hour

Model 5-48 Attains Speed of 75 Miles Per Hour in 1-Hour Test on Speedway— 3-38 Makes Over 62 Miles in an Hour

Packard 3-38 making high speed in hour test on the Speedway

INDIANAPOLIS, IND., June 20—A Packard stock touring car covered more than 70 miles in a 1-hour trial at the motor speedway today, settling definitely the ancient contention that no stock touring car is capable of a speed of a mile a minute. The car that made the 70-mile run in the hour was a new Packard 5-48. To clinch the argument on the mile-a-minute question, a Packard 3-38 covered over 62 miles in the hour.

The hour trials were held under the supervision of the Automobile Club of America, the cars being officially timed by Herbert Chase of the A. C. A. and the stock status of the cars determined by him. The trials were opened by J. G. Vincent, chief engineer of the Packard company, in the 3-38 phaeton, but after running three laps at an average of 62 miles per hour he stopped with a broken water pump.



Technical officials examining motor after the speed trial

W. R. McCulla, assistant research engineer of the company, then started out with the 5-48 phaeton, for a 1-hour run, with the intention of maintaining a speed of just over 70 miles per hour. The run was completed on this schedule without stop, the exact distance covered in the hour being 70 miles, 2,362.8 feet or 70.447 miles. A feature of as great importance as the total distance covered was the consistent running of this car. Only three laps averaged less than 70 miles per hour and none were less than 69.7. The fastest lap was the last lap, which was made at an average speed of 71.2. It speaks volumes for the condition of the car at the end of the run that it could be opened up to this speed after its 60-minute grind.

After the conclusion of this test, McCulla took the wheel of the 3-38 phaeton, which had been fitted with a new pump meanwhile. Its showing on this trial was as good as that of its larger mate, a distance of 62 miles, 2,244 feet being covered within the hour, or 62.425 miles per hour for the 60 minutes. One stop of 1 minute 5 seconds was made after running 47.5 miles, to take on oil. This made one lap drop to a speed of 39.4 miles per hour. Aside from this one lap the slowest one was 63 miles per hour. Like that of the larger car the fastest lap was the last lap, which was made at an average of 67.8 miles per hour. Consistency in running was a feature of this test as it was of the other.

5-48 Makes 75 Miles an Hour

On the back stretch the cars were opened out a bit, the stop watches catching the larger car at a speed of 75 miles per hour at times and the smaller one at 71.4. With the stock gear ratios which these cars had, the larger motor was

Lap Times Made by Packard Stock Touring Cars, Models 5-38 and 3-38, in Special

	Laps	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
3-38 Phaeton J. G. Vincent Chief Engineer	Elapsed	2:24.0	50.2		*											
	Lap	2:24.0	2:26.2	2:24.0	4:30.5											
	Average	62.5	61.5	62.5	33.3											
5-48 Phaeton, W. R. McCulla Assistant Research Engineer	Elapsed	52:29.4	54:37.2	56:44 4	58:51.6	01:00:58.4	03:05.6	05:13.4	07:21.2	09:28.2	11:35.2	13:42.8	15:51.8	17:59.4	20:06.8	22:14.6
	Lap	2:08.2	2:07.8	2:07.2	2:07.2	2:06.8	2:07.2	2:07.8	2:07.8	07.0	07.0	07.6	09 0	07.6	07.4	07.8
	Average	70.1	70.3	70.5	70.5	70.5	70.5	70.3	70.3	70.7	70.7	70.4	69.7	70.4	70.5	70.3
3-38 Phaeton W. R. McCulla	Elapsed															
	Lap	2:20.3	2:20.2	2:21.9	2:21.3	2:23.9	2:21.0	2:21 8	2:21.4	2:22.1	2:22.3	2:21.2	2:21.2	2:21.8	2:22.4	2:22.6
	Average	64.1	64.1	63.5	63.6	62.6	63.8	63.5	63.7	63.4	63.3	63.7	63.7	63.5	63.2	63.1

*Vincent starts out makes 3 laps at rate of 62 m.p.h. and stops with broken water hose connection Trial started over again †Oil 1:05.

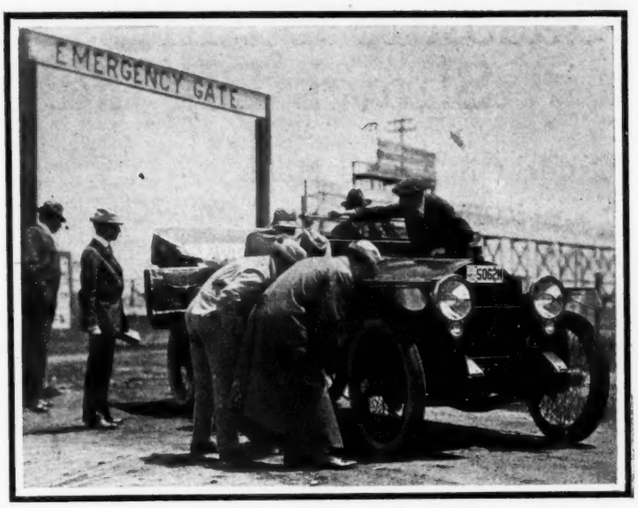
geared to turn over at 900 revolutions per minute at a road speed of 31 miles per hour and the smaller one at 900 revolutions per minute at 28 miles per hour. Calculating from the average speed maintained, and neglecting slippage, which was considerable on the somewhat uneven track, the 5-48 motor turned over at an average of 2,175 revolutions per minute for the hour. During its hour trial the 3-38 engine was turning over at an average of 2,004 revolutions per minute.

The two cars which accomplished the hour records were not specially selected cars fresh from the Detroit factory. They have each had over 7,000 miles of the roughest kind of road work, having just returned from a transcontinental trip to Los Angeles and back. According to Frank H. Trego, research engineer of the Packard company and who is responsible for the trials, the cars were stock in every respect, even the size of the nozzles in the carbureters being the same, whereas by the substitution of slightly larger nozzles, considerably more speed could have been obtained.

Both cars are 1915 series but are practically the same as the corresponding models of the 1914 production. The 5-48 is the 1914 4-48 with slight refinements. The motor is a six-cylinder, the bore and stroke remaining the same, 4 1-2 by 5 1-2. The engine has been cleaned up somewhat as to its external appearance by the removal of some of the external oil pipes, a screen has been fitted to the air intake horn on the carbureter and an overrunning clutch to the fan. The headlights have been redesigned, but in other respects the car is the same as its predecessor.

Similar refinements appear in the 3-38, which is the successor of the 1914 2-38. The six-cylinder motor is the same as that of the 5-48 except that the bore is 4 inches instead of 4 1-2; the stroke is the same, 5 1-2 inches. Both cars are equipped with the Packard-Bijur electric lighting and cranking system, Bosch magneto, Packard carbureter, A. C. spark plugs, Hartford shock absorbers in the rear, and Goodrich Silvertown cord tires. These are 36 by 4 1-2 in front and 37 by 5 in the rear. No tire trouble was encountered during the tests, and only one tire of the eight showed appreciable wear. Dunlop wire wheels were fitted to the cars.

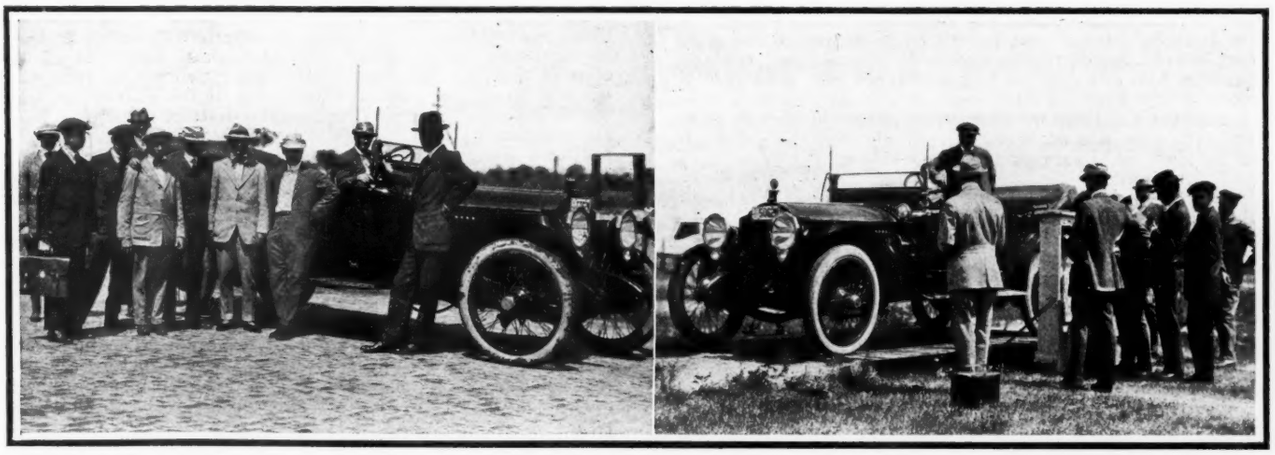
The official weight of the cars with driver, gasoline, water and oil was 4,895 pounds for the big car and 4,727 for the smaller one. McCulla, who was the driver in both runs, weighs 192 pounds.



Measuring the 5-48 for wind resistance

To show the consistent running of the two cars in these trials the speed for each lap of each car is given below:

LAP NO.	5-48 M.P.H.	3-38 M.P.H.	LAP NO.	5-48 M.P.H.	3-38 M.P.H.
1	70.1	64.1	16	70.3	63.0
2	70.3	64.1	17	70.2	63.1
3	70.5	63.5	18	69.8	63.3
4	70.5	63.6	19	70.0	62.2
5	70.8	62.6	20	70.5	39.4
6	70.5	63.8	21	70.1	65.9
7	70.3	63.5	22	70.3	65.9
8	70.3	63.7	23	70.4	66.5
9	70.7	63.4	24	70.3	66.4
10	70.7	63.3	25	70.1	67.5
11	70.4	63.7	26	70.3	67.8
12	69.7	63.7	27	69.7	..
13	70.4	63.5	28	70.5	..
14	70.5	63.2	29	71.2	..
15	70.3	63.1			



At left—Left to right—Jos. Boyer, Jr., Herbert Chase, James Corbett, E. H. Belden, D. S. Hatch, F. H. Trego, Carl G. Fisher, C. S. Ricker, W. R. McCulla, and S. D. Waldon. At right—Weighing the 5-48 before the speed trials

1-Hour Speed Trials at Indianapolis Motor Speedway on Saturday, June 20

16	17	18	19	20	21	22	23	24	25	26	27	28	29	
24:22.4	26:30.4	28:39.2	30:47.6	32:55.0	35:03.2	37:11.0	39:18.6	41:26.4	43:34.6	45:42.4	47:51.4	49:58.6	52:04.8	Distance for hour: 70:2362.8 ft.
07.8	08.0	08.8	08.4	07.4	08.2	07.8	07.6	07.8	08.2	07.8	09.0	07.2	06.2	70.447 miles.
70.3	70.2	69.8	70.0	70.5	70.1	70.3	70.4	70.3	70.1	70.3	69.7	70.5	71.2	70.447 M.P.H.
														Engine turning over 2175 R.P.M.
														Elapsed time, 61 min. 44.4 sec.
									60:04	Total time, 60:04				62 m., 2,244 ft.
2:22.8	2:22.7	2:22.2	2:24.9	†3:48.5	2:16.5	2:16.5	2:15.3	2:15.8	2:13.4	2:12.8				62.425 miles in hour.
63.0	63.1	63.3	62.2	39.4	65.9	65.9	66.5	66.4	67.5	67.8				Engine turning over 2,004 R.P.M.

Gasoline Business Shows Big Gain

Crude Oil Prices Have Dropped 30 Per Cent.—Gasoline as Low as 10 Cents

NEW YORK CITY, June 22—As a result of the cuts in the prices of the petroleum products, it is stated that most of the Standard Oil refining companies will not make as good a showing in net earnings for the first 6 months of the current year as in the same period last year. The gasoline business is in a very good condition, a large increase having been made, but the consumption of lubricating oils, particularly in the East, has taken a big drop.

Crude oil prices generally have been cut anywhere from 20 per cent. to 30 per cent., while prices of refined products have shown reductions of from 20 per cent. to as high as 40 per cent. in some cases. In the middle West the consumption of refined oil is understood to have increased greatly this year, but prices have been reduced more in this territory than any other, principally owing to severe competition.

Gasoline prices in this city remain the same as last week, that is at $.14 for the dealer and $.16 for the automobilist. In New Jersey gasoline is being sold by the Texaco stations at $.10 and $.11 per gallon. In Grand Rapids, Mich., gasoline is now being sold at $.10 a gallon. A year ago a gallon of gasoline was being sold at $.22 a gallon. The gasoline war, as it is called in Muskegon, Mich., has made it possible to buy gasoline at $.10 1-2 a gallon. A week ago it was selling at $.17 a gallon. It is predicted that within a month, if the fight keeps on, gasoline will be sold at $.06 to $.07 a gallon. Gasoline went down to .11 1-2 in Milwaukee, June 15. This is the 60 test product. Other grades are quoted at former prices. A sixth cut in the prices of its products was made by the Standard Oil Co. of Indiana, at St. Louis, this week. The last cut on gasoline was $.01 1-10 per gallon, the price tumbling from $.12 to $.10 9-10. Coal oil dropped from $.06 1-2 to $.05 9-10 per gallon while naptha was cheapened $.01 1-10 a gallon dropping from $.10 to $.08 9-10. Since the Indiana concern was permitted to return to the state by a ruling of the Supreme Court, it has reduced the cost of gasoline $.06 and coal oil $.03 and these cuts were met in almost every case by the smaller and independent dealers throughout the state which number about thirty. The Standard refineries are at Wood River, Ill., and the price of the oil in East St. Louis on the same side of the Mississippi is $.11 1-2 a gallon.

A price war being held by garage owners in Jersey City has reduced the price of gasoline from $0.20 to $0.09 a gallon. The Standard Oil Co. started the fight by selling to a combination of garage owners at greatly reduced figures. Rival garage men combined and made an arrangement with the Gulf Refining Co. to buy at a price less than quoted to their rivals.

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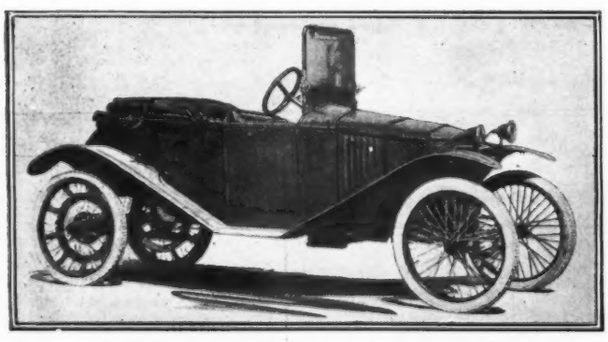
Arrow Cyclecar Makes Its Debut

NEW YORK CITY, June 22—One of the most recent additions to the rapidly growing cyclecar field is the Arrow, a side-by-side seater, manufactured by the National United Service Co., Detroit, Mich. This machine sells for $395 fully equipped and is fitted with a four-cylinder motor, friction change speed and double belt drive. It is distinguished by a well-designed streamline body and by its full equipment, which includes: an electric lighting outfit consisting of two headlights and one tail light supplied by a 40-ampere hour storage battery; top and side curtains; one-piece windshield; horn and tools.



Arrow cyclecar made by the National United Service Co.

The motor is 18-horsepower, water-cooled design located back of a V-shaped radiator. Lubrication is by splash, with gravity feed from a 2-quart tank under the cowl. Ignition is furnished by an Atwater-Kent Unisparker which will give 2,700 to 3,000 miles per set of dry cells, it is stated.

Left steering through a 15-inch wheel and a rack and pinion gear is used. The wheelbase is 100 inches, the tread 40 inches, the clearance 10 inches and the weight 850 pounds.

Wire wheels equipped with cup and cone ball bearings are employed and the tires are 28 by 3. The frame is of pressed steel and it is mounted on quarter-elliptic front springs and full cantilever in the rear.

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Dodge Bros. Make New Appointments

DETROIT, MICH., June 17—General Sales Manager A. I. Philp of Dodge Bros., has made three new appointments of district representatives—J. S. Collins, formerly with the International Harvester Co., and later with the Buick Motor Car Co., as representative for the Detroit district, which means the Michigan southern peninsula, the eastern half of the northern peninsula, and the northern tiers of counties in Ohio and Indiana. H. D. Day is made Boston representative. Mr. Day was at one time general sales manager of E. T. Burrows Co., and later vice-president and sales manager of the Self Operating Valve Co., of Washington, D. C. Mr. Day's territory will be all of New England excepting the state of Connecticut. John A. Nichols, Jr., formerly a newspaperman and latterly with the Franklin Motor Car Co., Syracuse, N. Y., as representative for the Seattle district.

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1,200 Lozier Fours Sold Since March

DETROIT, MICH., June 21—At the 2-days' meeting of district managers and salesmen of the Lozier Motor Co., of Detroit, it was stated by President John M. Gilbert that 1,200 Lozier fours had been marketed since March, and that while the demand for six-cylinder cars is very great there is still a large percentage of owners and prospective owners who want four-cylinder cars. Sales Manager Paul Smith is of the opinion that the fall season will open much earlier this year. Among the Lozier men in attendance at the convention were the following: F. P. Willis, eastern district manager; W. J. Drumplemann, central district manager; R. R. Ramsey, southern district manager; Louis Logie, Canadian district manager; E. F. McConaha, John Rice, C. M. Logan, Jean Falk, F. H. Sides, A. E. Wingert, J. C. Kelly, H. M. Gray, W. H. Shay and J. M. Robbins.

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New Co. to Manufacture Malcolm Cyclecar

NEW YORK CITY, June 22—The Malcolm Cyclecar Co. has been formed to manufacture the Malcolm cyclecar at Plymouth, Mich., 18 miles from Detroit, Mich. The new company will occupy its own brick and concrete factory and has completed all arrangements to produce cars in large numbers.

E. M. Jones will be retained as general manager, and C. H. Lawrence as sales manager. E. M. Jones, C. H. Lawrence, C. H. Bennett, B. B. Bennett and C. Fisher are several of the stockholders and directors of the company.

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Buick Branch Managers in Convention

FLINT, MICH., June 20—The annual meeting of branch managers and distributors of the Buick Motor Co., of Flint, took place June 19 and 20. The following branch managers attended: E. T. Strong, Chicago; George B. McCutcheon, Atlanta; J. E. Trotter, Indianapolis; Robert McKay, Battle Creek, Mich.; H. K. Noyes, Boston; J. A. Coy, Buffalo; J. W. Atwood, Dallas, Tex.; C. C. Starkweather, Detroit; J. F. Martin, Kansas City, Kan.; N. J. Munson, Milwaukee, Wis.; A. G. Southworth, New York; W. H. Vesper, Oklahoma City, Okla.; P. S. Russell, Philadelphia; A. H. Server, Pittsburgh; B. R. Webb, San Antonio, Tex.; J. E. Finney, Savannah, Ga.; R. H. Martin, Washington, D. C. The following distributors also were present: A. G. Randall, Boise, Idaho; C. Coddington, Charlotte, N. C.; H. S. Leyman, Cincinnati, O.; G. G. Peckham, Cleveland; F. L. McFarland, Denver;

H. E. Sides, Lincoln, Neb.; Edgar M. Rowe, Little Rock, Ark.; F. S. Howard, Los Angeles; H. E. Pence, Minneapolis, Minn.; Lee Huff, Omaha, Neb.; M. G. Johnson, Portland, Ore.; C. L. Whiting, Rochester, N. Y.; G. S. Garber, Saginaw, Mich.; F. W. A. Vesper, St. Louis, Mo.; A. E. Thoursen, Salt Lake City, Utah; C. S. Howard, San Francisco; S. C. Douglas, Sioux City, Iowa.

100 Hoosier Maxwell Dealers at Factory

DETROIT, MICH., June 22—About 100 Maxwell dealers, all from Indiana, were the guests of the Maxwell Motor Co., of Detroit, today. After a visit of the Maxwell plants a tour of the city was made and at 1 the Hoosiers were entertained at luncheon at the Detroit Motor Boat Club. In the evening the visitors were the guests of the company at a theater party at the Temple. Every one of the dealers will return to his home town in a new Maxwell 25 and whoever can't drive his car will lose the Maxwell agency.

Transcontinental Saxon Makes 30 M. P. G.

DETROIT, MICH., June 24—The Saxon car traveling from this city to San Francisco has reached Wamsutter, Wyo. The car has averaged about 30 miles to the gallon.

A large crowd of motorists and pedestrians stops daily in front of the salesroom of the Saxon company to see the progress made by M. A. Croker and Fred Wilkin, in the Saxon transcontinental small car. A simple and clever way to tell the story of the arrival at the nightly stopping place has been found, in the shape of a white painted route acros the full width of the big show window. On the route are shown the principal cities through which the car passes. The place where the car has been reported from as the night stopping place is indicated on the window by a miniature Saxon car above which is painted a large arrow.

Motor Truck Club Talks on Ideal Garage

NEW YORK CITY, June 17—The June meeting of the Motor Truck Club was held June 17 at the Automobile Club of America, this city. An ideal, or at least an efficiently planned and built garage, was described by Harold Martin, of the H. C. & A. I. Piercy Contracting Co., and "The Ideal Garage and the Garage as It Actually Is," was a paper presented by Joseph Husson, of the staff of *The Commercial Vehicle*. He showed stereopticon slides, depicting the actual conditions prevailing in this city's commercial garages. The fact that many of the garages are in former livery stables was held responsible for much of the poor arrangements, while newer structures generally were productive of better results.

G. A. Green, of the Fifth Avenue Coach Co., spoke on the "Description of a Modern Truck Garage"; A. F. Masury, service manager for the International Motor Co., talked on "What Constitutes Proper Garage and Equipment for Gasoline Trucks," and D. C. Fenner, district manager for the General Vehicle Co., talked on "Repair Shop Forms." The club indorsed the street commissioner's proposal to motorize one cleaning district of the city and bring it up to date as an experiment.

Pittsburgh Section Adds to E. V. A. A.

NEW YORK CITY, June 24—To the seven local sections, New England, Chicago, Philadelphia, Washington, Cincinnati, San Francisco and Los Angeles, already existing, the Pittsburgh section of the Electric Vehicle Assn. of America was added recently. The following are the officers of the new section: W. A. Donkin, chairman; T. H. Schoepf, vice-chairman and J. A. Jaques, secretary.

There will be an exhibit of electric vehicles, batteries and accessories at the Fifth Annual Convention of the Electric Vehicle Assn., to be held in Philadelphia, October 19, 20 and 21.

Electric Vehicle Assn. Holds Meeting

NEW YORK CITY, June 19.—Having handled weighty problems during its meetings of the past season, the Electric Vehicle Assn. of America banished all seriousness at its closing session, Friday evening, June 19, held in the auditorium of the N. Y. Edison Co., at Irving Place and East 15th street, New York City. The program was interesting from start to finish, and the big hit of the evening was a two-reel "movie" on "Selling Electric Vehicles."

In the films the characters were men prominent in the association, and the audience happily followed the big merchant's solution of his horse-haulage problem by the installation of a fleet of electrics. The association co-operated with him and helped him work out the answer. The film was donated by the Edison Storage Battery Co., the scenario being by Stephen G. Thompson, of the Public Service Electric Co. of New Jersey. The part of the merchant was taken by J. F. Becker.

The films are to be a feature of future electric development work. They will be supplied to any accredited electric association, and even now have started on a circuit. They will be shown at the convention in Philadelphia, October 19-20-21.

About the only business was a report that the membership in the association has grown from 437 last October to 762 now, and that from one organization a few months ago there now are branches in New England, Chicago, Philadelphia, Washington, D. C.; Cincinnati, San Francisco, Los Angeles and Pittsburgh.

Philadelphia Truck Assn. Adds Members

PHILADELPHIA, PA., June 20—At a meeting of the Motor Truck Assn. of Philadelphia, held on June 17 at the Adelphia Hotel, W. H. Metcalf, of The Bartlett Garages, Inc., acted as chairman in the absence of the president, E. B. Jackson, of the Packard Motor Car Co. Representatives were present from all of the motor truck salesrooms in Philadelphia. Each of the tire companies had a representative present. At this meeting the motor truck body builders had been invited to attend and there was a representative from all of the larger body building houses in Philadelphia and vicinity, including Trenton.

Lieutenant William D. Mills of the traffic squad gave an excellent address on the traffic situation in Philadelphia.

E. J. Cattell, the City Statistician, aroused great enthusiasm by his facts and figures of the enormous manufacturing industries in Philadelphia.

Mr. Cattell was followed by E. S. Foljambe, Editor of the *Commercial Car Journal*, who gave a very interesting talk.

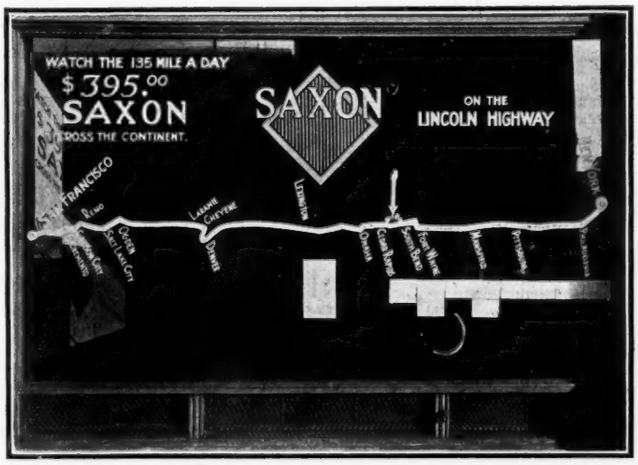
A number of new members were taken into the association, E. M. Bartlett of the Stanley Motor Carriage Co. was appointed chairman of the publicity committee, and Emlen S. Hare of the Commercial Truck Co. was appointed chairman of the entertainment committee. W. Ross Walton was elected chairman of the admission committee.

New York Regal Agency in New Hands

NEW YORK CITY, June 20—The Regal car in this city will be handled hereafter by Webster & MacGowan, who have taken a store at 1700 Broadway.

Intermountain Cities Favored by Supreme Court

NEW YORK CITY, June 22—The United States Supreme Court, today, in the intermountain rate case, ruled that a railroad shipping from eastern point may not charge a greater rate for such a city as Phoenix, Ariz., than is charged for shipment to points on the Pacific Coast. Under the old plan it had been customary to make the charge to Phoenix, for instance, the sum of the charge from the eastern point to the coast and the local rate from the coast back to Phoenix.



Novel window display of Detroit Saxon company to show progress of transcontinental car

1913 Tire Exports Total $3,943,220

Exports Were $2,657,809 in 1912—Canada Consumes One-Third of Exports

WASHINGTON, D. C., June 20—The bureau of statistics has compiled some interesting information showing the exports of motor car tires during certain periods. During the fiscal year ended June 30, 1913, these exports amounted in value to $3,943,220. During the same period of 1912 these exports were valued at $2,657,809, while in 1911 the value was $2,085,107.

The exports, by grand divisions, in 1913, were as follows: Europe, $1,977,029; North America, $1,626,155; South America, $100,065; Asia, $36,212; Oceania, $185,807; Africa, $17,952.

Our best customer for tires in 1913 was Canada, which imported $1,324,459 worth. England was second, with imports valued at $1,125,718, while Belgium was third, with an import value of $401,900. Germany holds fourth place, with imports of tires from this country valued at $401,196.

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N. A. C. C. Opposes Increase in Freight Rates

NEW YORK CITY, June 20—Two plans that would materially increase freight rates on automobiles are being considered by the official classification committee of the railroads in New York City this week.

One relates to a proposed packing requirement on polished sheet iron and steel. Strong opposition is made to the suggestion that polished sheet iron and steel, U. S. Standard Gauge No. 20, or thinner must be packed in metal cases with wooden covers for shipment. The method of shipping this material has been to place a pile of sheets in each corner of a box car and hold them in place by proper arrangement of 2 by 4 timbers. It is of this sheet steel that many parts of automobiles are manufactured, such as bodies, hoods, fenders, drip pans, etc., and it is estimated that the industry consumes from 50,000 to 75,000 tons annually, which is a very considerable proportion of the total production of polished sheet steel. If the railroads adopt the requirement that this material must be boxed for shipment it is estimated that $6 to $8 per ton will be added to the cost to automobile manufacturers, or a total of something like $500,000 per year. The National Automobile Chamber of Commerce appeared at the railroad meeting and strongly opposed the suggested change.

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Opportunity To Save Freight Charges

NEW YORK CITY, June 22—The National Automobile Chamber of Commerce has issued a circular showing how automobile engine parts should be billed when shipped to and from points west of Chicago, to insure the proper freight rate being applied by the railroads. It is pointed out that automobile metal parts which are not otherwise specified in the Western classification are rated first class in less than carload lots, whereas metal parts of the engine which are not otherwise specifically rated come under the general heading of machinery parts, knocked down, in boxes, bundles or crates, and take second-class freight rates. Western dealers will profit by observing this distinction, and when shipping engine parts that are not specifically rated the second-class rating can be secured by packing separately from other parts and billing them as gasoline engine parts, whereas, if billed merely as automobile metal parts, they will take first-class freight rates.

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White Co.'s Founder Passes Away

CLEVELAND, O., June 23—Thomas H. White, up to a month ago, the active head of the White Sewing Machine Co., died yesterday, at his home in this city. Mr. White is the father of Windsor T., Rollen H., Walter C. and Clarence G. White. Windsor White is president of the White Co., manufacturer of autombiles, while Walter C. White is sales manager.

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Pope's Creditors Given a Week

HARTFORD, CONN., June 22—A week's time has been allowed in which to file claims against the Pope Mfg. Co. by Judge William L. Bennett in the superior court. Judge Bennett has also granted an extension of time of one week in which Harry R. Williams, the Tom Botherill Automobile Co. E. D. Dodge and others, holders of coupon notes may file their claims in Connecticut. Judge Bennett also allowed Edwin J. Blake and Albert L. Pope to intervene to be heard on their disallowed claims. The Eclipse Mfg. Co. will be similarly treated according to the court order. Blake is an aluminum founder who has supplied castings to the Pope company. Albert Pope is an officer of the company and the disallowance in his case amounted to approximately $40,000. A committee to hear the disallowed claims will be appointed by the court June 24. The hearing on that $1,800,000 offer for the company's property in Connecticut comes up at the same time.

—

N. J. Collects $106,133.51 More than in 1913

TRENTON, N. J., June 18—The report for the year ending May 31 shows that the New Jersey State department of motor vehicles has received $106,133.51 more in 1914 than it did in 1913 for automobile, motorcycle and drivers' licenses.

In the same time there was an increase of $2,764.01 in the amount of fines collected. For the year 1913, $37,118 was collected for the automobile licenses, while in 1914 the receipts amounted to $46,057, an increase of $9,939. In drivers' licenses $41,596 was collected in 1913 and in 1914 $49,390. The total collections for 1913 were $494,202.24, while in 1914 it came to $600,335.75, an increase of $106,133.51. The fines collected in 1913 were $2,681.59, while in 1914 they were $5,445.60, the increase being $2,764.01.

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Louisville Men Buy Kentucky Wagon Stock

LOUISVILLE, KY., June 18—Stock in the Kentucky Wagon Mfg. Co., owned by W. C. Nones, former president, and his son, Seth M. Nones, has been purchased by a syndicate of Louisville capitalists. The price, it is understood, was something a little better than $42 a share for 1,200 shares, making the amount involved upward of $50,000. Although the names

Market Reports for the Week

Market changes were few last week. Tin rose to $30.85 at a gain of $0.47 per 100 pounds. The rise in London of tin had general effect on the rise in this country. There was some increase in the demand for small lots of nearby positions as well as more interest in far off positions. Electrolytic copper closed at $0.13 5-8 per pound. There is very little copper in second hands, at least the offerings are light. Lead was steady at $3.90. The principal event in the crude rubber trade on Tuesday was the auction of plantations which was held in London. The quantity offered was stated at about 1,000 tons. Prices were generally steady on this side of the market and trading conditions continued on a small scale.

Material	Wed.	Thurs.	Fri.	Sat.	Mon.	Tues.	Week's Changes
Antimony	.05¾	.05¾	.05¾	.05¾	.05¾	.05¾	.....
Beams & Channels, 100 lbs.	1.26	1.26	1.26	1.26	1.26	1.26	.....
Bessemer Steel, ton	19.50	19.50	19.50	19.50	19.50	19.50	.....
Copper, Elec., lb.	.13¾	.13¾	.13 7/10	.13 7/10	.13 7/10	.13 5/8	—.00⅛
Copper, Lake, lb.	.13⅞	.13⅞	.13⅞	.13⅞	.13⅞	.13⅞	.....
Cottonseed Oil, bbl	7.26	7.28	7.24	7.24	7.24	7.19	—.07
Cyanide Potash, lb	17.	.17	.17	.17	.17	.17	.....
Fish Oil, Menhaden, Brown	.40	.40	.40	.40	.40	.40	.....
Gasoline, Auto, gal.	.14	.14	.14	.14	.14	.14	.....
Lard Oil, prime	.93	.93	.93	.93	.93	.93	.....
Lead, 100 lbs.	3.90	3.90	3.90	3.90	3.90	3.90	.....
Linseed Oil	.54	.54	.54	.54	.54	.54	.....
Open-Hearth Steel, ton	19.50	19.50	19.50	19.50	19.50	19.50	.....
Petroleum, bbl., Kans., crude	.75	.75	.75	.75	.75	.75	.....
Petroleum, bbl., Pa., crude	1.80	1.80	1.80	1.80	1.80	1.75	.....
Rapeseed Oil, refined	.59	.59	.59	.59	.59	.59	.....
Rubber, Fine Up-River, Para	.69	.69	.69	.69	.69	.69	.....
Silk, raw, Ital.	..	5.10	..	..	5.00	5.00	—.10
Silk, raw, Japan	..	4.35	..	..	4.35	4.35	.....
Sulphuric Acid, 60 Baume	.90	.90	.90	.90	.90	.90	.....
Tin, 100 lb.	30.38	30.60	30.45	30.38	30.60	30.85	+.47
Tire Scrap	.04¾	.04¾	.04¾	.04¾	.04¾	.04¾	.....

of those making the purchase are withheld, it is believed that R. V. Board, president, and others interested in the company who are supporting Mr. Board, are among the purchasers. The transfer removes a disagreement which had existed in the company. Mr. Nones had taken issue with the policy adopted under Mr. Board's management. Recently Mr. Nones made an unsuccessful effort to change the management. The Kentucky Wagon Mfg. Co. manufactures the Urban electric truck.

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Warren Mails 5 Per Cent. Dividend

DETROIT, MICH., June 20—The Detroit Trust Co., receiver in equity for the bankrupt Warren Motor Car Co., of Detroit, is mailing a 5 per cent. dividend to the creditors, thus making it a total of 20 per cent. equal to about $20,000, which has been paid thus far. With the exception of some receivable accounts, the estate has been liquidated. The closing of the estate has suffered delays on account of certain claims, most of which were unliquidated claims for damages, dealers' deposits and preferred stock, to which the trust company had objected.

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Entire Herreshoff Plant Sold

DETROIT, MICH., June 22—The entire plant and equipment consisting of all patterns, tools, etc., of the Herreshoff Motors Co., Detroit, Mich., was purchased on June 6, by the Levene Motors Co., Philadelphia, Pa. The entire plant will be transferred to its Indianapolis headquarters and run in connection with the American Motors Co., which it recently purchased. Herreshoff car owners will be able to obtain repair parts from that point after July 1.

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Overland Earnings Estimated at 30 Per Cent.

NEW YORK CITY, June 22—It is estimated that the Willys-Overland Co. will earn in the neighborhood of 30 per cent. on its common stock for the fiscal year to end June 30 next. This, it is stated, will be shown after allowing liberal deductions for depreciation. Last year the company earned in the neighborhood of 26 1-2 per cent. on its common stock, and in addition to the regular dividend a substantial extra disbursement was made to common shareholders.

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NEW YORK CITY, June 22—The directors of the Electric Storage Battery Co., Philadelphia, Pa., have declared a dividend of 1 per cent. from the net earnings of the company on both common and preferred stocks, payable July 1, 1914, to stockholders of record at the close on June 20, 1914.

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NEW YORK CITY, June 22—The Yale & Towne Mfg. Co. has declared the regular quarterly dividend of 1 3-4 per cent. payable July 1 to stock of record June 22.

Automobile Securities Quotations

NEW YORK CITY, June 24—Automobile and allied securities shared the general weakness of the stock market during the past week, there being very few gains of any description and these being very small in every case. On the other hand a great many companies suffered slight declines in the value of their securities, due to the general inactivity of the market and about half of the stocks stood at the same level as last week. There seems to be no special news regarding these fluctuations.

Among the changes noted this week is a drop of 9 points in Case stock, and one of 2 3-4 in Texas Oil, while Kelly-Springfield Tire common declined 3 points, and Goodyear Tire common, 2. Reo Motor Car Co., was 2 points weaker than last week, though the Reo Motor Truck stock showed a gain of 3-4 point. General Motors common increased 2, and Chalmers common gained 1 point, while New Departure common gained 1 point, and the preferred, 1-2 point. The complete tabulation for the week follows:

Security	Wednesday Bid	Wednesday Asked	Thursday Bid	Thursday Asked	Friday Bid	Friday Asked	Saturday Bid	Saturday Asked	Monday Bid	Monday Asked	Tuesday Bid	Tuesday Asked	Week's Change	1913 Bid	1913 Asked
Ajax-Grieb Rubber Co. com	220	..	220	..	220	..	220	..	220	..	220	..	..	155	165
Ajax-Grieb Rubber Co. pfd	99	..	99	..	99	..	99	..	99	..	99	..	..	93	100
Aluminum Castings pfd	98	100	98	100	98	100	98	100	98	100	98	100	..	97	100
Case T. M. Co., J. I.	80¾	88	80¾	90	80¾	90¾	80¾	90	81	90	81	90	—9	..	..
Chalmers Motor Co. com	98	102	98	102	98	102	98	102	99	103	99	103	+1	127	137
Chalmers Motor Co. pfd	96½	99	96½	99	96½	99	96½	99	95	98	95	98	—1½	97	102
Electric Storage Battery Co	52	52½	51	52	50½	51½	51	51½	51	51½	51	51½	—1	..	..
Firestone Tire & Rubber Co. com	300	305	300	305	300	305	300	305	300	305	300	305	..	235	245
Firestone Tire & Rubber Co. pfd	108	109½	108	109½	108	109½	108	109½	108	109½	108	109½	..	104	106
Garford Co. pfd	75	85	75	85	75	85	75	85	75	85	75	85	..	85	95
General Motors Co. com	91	92¼	92	93½	92	93½	93	94	93	94	93	94	+2	26½	28
General Motors Co. pfd	93	93½	93	93½	93	94	93	94	93	94	93	94	..	72¾	75
B. F. Goodrich Co. com	24	24¼	24⅜	25	24½	27⅞	24⅝	25	24½	25	24½	25	— ¼	26½	28
B. F. Goodrich Co. pfd	90	90½	90	90½	88¼	90	88¼	90	88¼	90	88¼	90	—1¾	90	92
Goodyear Tire & Rubber Co. com	172	175	172	175	172	175	172	175	170	175	170	175	—2	294	300
Goodyear Tire & Rubber Co. pfd	97½	99	97½	99	97½	99	97½	99	97	99	97	99	— ½	96	‡98
Gray & Davis Co. pfd	95	102½	95	102½	95	102½	95	102½	95	102½	95	102½	..	..	..
International Motor Co. com	..	5	..	5	..	5	..	5	..	5	..	5	..	3	6
International Motor Co. pfd	3	10	3	10	3	10	3	10	3	10	3	10	..	18	25
Kelly-Springfield Tire Co. com	57	63	58	60	58	60	58	60	58	60	58	60	—3	..	..
Kelly-Springfield Tire Co. 1st pfd	75	83	75	80	70	80	75	80	75	80	74	76	..	..	..
Kelly-Springfield Tire Co. 2d pfd	93	100	90	100	90	100	93	100	93	100	90	100	..	..	..
Lozier Motor Co. com	..	21½	..	21½	..	21½	..	21½	15	20	15	20	..	15	25
Lozier Motor Co. pfd	30	43	30	43	30	43	30	43	..	41	..	41	..	..	92
Maxwell Motor Co. com	14½	14¾	14½	14¾	14½	14¾	10¾	10⅞	14½	14⅞	14½	14¾	..	3	5
Maxwell Motor Co. 1st pfd	42	44	43½	45	43	45	44	44½	43	44½	43	44½	..	27	31
Maxwell Motor Co. 2d pfd	17½	18	18	18½	17½	18½	17½	18¼	17½	18½	17½	18½	..	8	11
Miller Rubber Co	139	142	139	142	139	142	139	142	139	142	139	142	..	..	140
New Departure Mfg. Co. com	125	127	125	127	125	127	125	127	126	127	126	128	+1	..	..
New Departure Mfg. Co. pfd	106	107	106	107	106	107	106	107	106½	..	106½	..	+ ½	..	..
Packard Motor Co. com	103	..	103	..	103	..	103	..	103	..	103	..	..	..	..
Packard Motor Co. pfd	97	100	97	100	97	100	97	100	97	100	97	100	..	..	..
Peerless Motor Co. com	18	25	18	25	18	25	18	25	18	25	18	25	..	40	50
Peerless Motor Co. pfd	..	62½	..	62½	..	62½	..	62½	..	62½	..	62½	..	..	96
Pope Mfg. Co. com	..	1	..	1	..	1	..	1	..	1	..	1	..	8	12
Pope Mfg. Co. pfd	..	3	..	3	..	3	..	3	..	3	..	3	..	33	38
Portage Rubber Co. com	..	40	..	40	..	40	..	40	..	40	..	40	..	..	40
Portage Rubber Co. pfd	..	90	..	90	..	90	..	90	..	90	..	90	..	..	90
*Reo Motor Truck Co	10	10¾	10	10¾	10	10¾	10	10¾	10¾	11¾	10¾	11¾	+ ¾	..	10
*Reo Motor Car Co	20	22	20	22	20	22	20	22	18	19	18	19	—2	..	20
Rubber Goods Mfg. Co. pfd	100	110	100	110	100	110	100	110	100	110	100	110	..	..	..
Russell Motor Co. com	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Russell Motor Co. pfd	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Splitdorf Electric Co. pfd	40	50	40	50	40	50	40	50	40	50	40	50	..	..	..
Stewart Warner Speedometer Corp. com	47	49	47	49	47	49	47	49	48	49	48	49	+1	..	..
Stewart Warner Speedometer Corp. pfd	97	99	97	99	97	99	97	99	98	100	98	100	+1	..	..
Studebaker Co. com	30½	31	31	31½	30¾	31½	30¾	31⅜	30¾	31⅜	30¾	31⅜	—1⅜	22	25
Studebaker Co. pfd	86½	88½	86½	88½	85	89	85	88½	85	88½	85	88½	—2	80	87
Swinehart Tire & Rubber Co	85	86	85	86	85	86	85	86	85	86	85	86	..	84	86
Texas Company	141½	142¼	142¼	143	143	143½	143¼	144½	143¼	144½	143¼	144½	—2¾	..	..
U. S. Rubber Co. com	58½	59	58½	59	58¼	59	58½	59	58½	59	58½	59	..	57	58
U. S. Rubber Co. 1st pfd	103	104	103	104	102⅞	103¾	103	103⅝	103	103⅝	103	103⅜	+ ⅜	101½	102
Vacuum Oil Co	223	225	222	225	220	225	222	225	221	225	221	224	—2	..	..
White Co. pfd	107	110	107	110	107	110	107	110	107	110	107	110	..	102	104
Willys-Overland Co. com	79	80	78	79	78	79	80	80⅛	80	80¼	80	81	+1	55	60
Willys-Overland Co. pfd	93	95	93	95	91¼	93¼	92½	95	92½	95	92½	94	— ½	84	90

*The par value of these stocks is $10; all others $100. ‡Ex. dividend.

New Head for Pullman

H. W. Hayden Replaces T. C. O'Connor, Resigned, as President—Plant Working Night and Day

YORK, PA., June 22—Thomas C. O'Connor resigned as president of the Pullman Motor Car Co., at a recent meeting of the company held in this city. H. W. Hayden, of Detroit, an automobile man of wide experience, recently connected with the Overland company, with a great deal of experience in Detroit and Milwaukee, has been made the new president of the company and assumed his new duties as manager of the plant this week. Oscar Stevenson remains secretary and treasurer of the company, and in other respects the management will be the same. Both Messrs. O'Connor and Stevenson will retain their positions as directors. The Pullman company is under contract to start July 1, building 5,000 cyclecars for the LaVigne company, Detroit. The LaVigne cars must be completed within a period of 8 months. This work and the building of Pullman cars will keep the plant running day and night.

Enger Brings Out Light Six for 1915

CINCINNATI, O., June 17—E. L. Jones, consulting engineer of the Enger Motor Car Co., Cincinnati, has finished the design of the company's 1915 model. The car is a light weight, six-cylinder, six-passenger type with a streamline body and complete equipment. The price of the car will be $1,495 or under. More detailed announcement will be made regarding the new car in an early issue of THE AUTOMOBILE.

New Imported Fiat Light 30 for $3,600

NEW YORK CITY, June 22—The Fiat Motor Sales Co., this city, announces a new imported Fiat light 30 selling at $3,600. This model carries five passengers and has a 30 horsepower monobloc engine. The wheel-base is 115 inches and the weight is 2,100 pounds. This model includes a one-man top, double-acting windshield and electric starter and lighting systems.

Kalamazoo Co. to Build 3,000-Pound Truck

KALAMAZOO, MICH., June 22—The Kalamazoo Motor Vehicle Co., which was organized here last September, is building a 30-horsepower 3,000-pound truck, of which twenty-five are to be built this year. At present about fifteen men are employed, but the force will be increased to fifty men before the first of next year. The trucks which are in service are giving good satisfaction and the business outlook is very bright. Agencies have been established throughout the country.

Bessemer Truck's Transcontinental Trip

NEW YORK CITY, June 22—A Bessemer truck is making a run from this city to Seattle, having started May 15 from Grove City, Pa., the home of the Bessemer company, going through Pittsburgh, Harrisburg, York, Lancaster, Philadelphia and Trenton to reach this city on Decoration Day. The truck at once left this city and is now making excellent progress toward South Bend, Ind. After arriving at this city, the truck will proceed on through Chicago, the Twin cities, Fargo, Bismark, Mandan, Livingston, Butte, Missoula, and Spokane to Seattle.

Marmon to Have New Service Station

NEW YORK CITY, June 22—The entire eighth floor in the building located at 16-24 West Sixty-second street, this city, has been leased by the Marmon agency. F. G. Carrie, manager, states that this new move will give the company 10,000 square feet of space.

Prest-O-Lite Co. Gets Preliminary Injunction

INDIANAPOLIS, IND., June 22—In the suit for injunction brought some time ago by the Prest-O-Lite Co. against Eldon J. Perry, Judge Albert B. Anderson, of the United States court, in this city, has issued a preliminary injunction.

Perry is restrained under the preliminary injunction from refilling Prest-O-Lite tanks with acetylene gas and selling it as Prest-O-Lite. He is also restrained from refilling Prest-O-Lite tanks unless the trade mark is removed or obliterated.

NEW YORK CITY, June 23—The Becker Steel Co., 90 West street, New York City, importer of German cobalt steel, has purchased the plant of the Balon Steel Co., Charleston, W. Va., and is incorporating a new company for $1,000,000. They intend to ship billets from Germany, and make various sizes and shapes for immediate delivery in this country.

Ford Owners' Day at Milwaukee

MILWAUKEE, WIS., June 21—More than 3,000 Ford owners from all parts of Wisconsin, a number from the extreme northwestern section, 400 miles from Milwaukee, participated in the first annual Wisconsin Ford Owners' Day at Milwaukee on Saturday, June 20.

Railroad Cannot Increase Charges

GRAND RAPIDS, MICH., June 21—Judge McDonald, of the Circuit Court, rendered a decision in favor of the Wolverine Brass Works, of this city, against the Southern Pacific Railroad Co., in a freight rate case, which may be finally carried to the U. S. Supreme Court. The Wolverine company had complained that after having made a shipment of brass fittings to San Francisco, under a railroad schedule of $1.78 the railroad company officials at San Francisco reclassified the shipment under the rate of plumbing materials at $2.60 and refused to deliver the shipment until the difference had been paid. The Wolverine company was given a verdict of $312 damages.

License All Road Vehicles

NEW YORK CITY, June 20—It is claimed that funds aggregating $130,000,000 a year could be raised for the construction and repair of highways if all vehicles were licensed under state laws on a basis proportionate to the use derived from and the wear and tear done to the roads.

Of this total, the 1,385,000 motor vehicles registered, at fees from $10 to $25, would produce nearly $19,000,000; the estimated 14,600,000 horse-drawn vehicles, at $5 to $20, would produce $108,000,000, and the estimated 2,800,000 bicycles and motorcycles in use, at $1 and $3 respectively, would bring $3,400,000.

National Campaign Against Speeding

MILWAUKEE, WIS., June 22—A national campaign against reckless driving and motor speeding will be put under way at once by the International Assn. of Police Chiefs, according to John T. Janssen, chief of police of Milwaukee, who was elected president of the association at the annual convention held in Detroit last week. Chief Janssen believes the same methods introduced in Milwaukee, which have greatly minimized the speeding evil, can be used in other cities and he will act as prime mover in the campaign. The plan is to pass a universal speed and traffic regulation law throughout the United States, by Congress, if possible.

Pedestrians Have Right of Way at Crossings

PHILADELPHIA, PA., June 19—A judicial opinion of much interest to both the motorist and the pedestrian as to the respective rights of each on the highway was rendered yesterday by Judge Sulzberger in refusing a new trial to a chauffeur who had been convicted of involuntary manslaughter and sentenced to 6 months in the county prison with a $250 fine attached thereto.

In refusing a new trial the court said, that at street crossings the pedestrians must have the right of way although at all other points the vehicle has it.

In Passing Motorist Must Warn

DETROIT, MICH., June 21—When an automobile and a horsedrawn vehicle are going the same way, and the motorist wants to pass the other vehicle, he must sound his horn or give some warning of some kind before going ahead. This is practically what Judge Dromgole, of the Essex county general court, said, in a decision rendered in the case of Charles F. Tapping, a farmer of Gosfield South, Canada, against Charles H. Fuller, a motorist from Union, Canada. On a dark night the farmer and the motorist were traveling in the same direction on the same road and the automobilist, with-

out warning, sped by the farmer. The latter's horse became frightened, ran away, damaged the farmer's wagon and itself. The court ordered the automobilist to pay $350 damages to the farmer.

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Wilson Endorses Lincoln Highway

WASHINGTON, D. C., June 22.—Official indorsement and approval of the proposed Lincoln Highway has been given by President Woodrow Wilson, who in a letter to H. B. Joy, president of the Lincoln Highway Assn., declares the roadway to be one of great need.

The President also suggested that official Lincoln Highway markers be placed in that part of the road entering Washington and passing the Lincoln memorial, now under construction here.

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Warner Resigns from Muncie Gear Works

NEW YORK CITY, June 22—T. W. Warner, president and general manager of the Warner Mfg. Co., Toledo, O., and the T. W. Warner Co., Muncie, Ind., has resigned from the Muncie Gear Works, Muncie. This company is practically out of debt and with careful management should develop into a substantial industry.

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Court Nullifies Alpena Creditors' Judgment

DETROIT, MICH., June 20—Judge Tuttle, of the United States District Court for the Southern Michigan district, has rendered a decision holding as void a number of judgments which outside creditors of the Alpena Motor Car Co., of Alpena, Mich., had obtained. A permanent injunction restraining the sheriff from disposing of the property of the Alpena Motor Car Co., either at auction or through any other way was also rendered. The creditors of the company who had filed a petition in bankruptcy against it in February are now given priority rights. Five outside creditors—the Spicer Mfg. Co., the Herbert Mfg. Co., Abraham Aaronson, the Apple Electric Co., and John Bornman & Son—who had obtained judgments 6 months previous to the bankruptcy proceedings must re-file their claims.

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TOLEDO, O., June 23—Ten thousand employees of the Willys-Overland Co. saw Connie Mack's Athletics, world's champions, play an exhibition game here today with the Chicago Cubs. The Cubs won the game by a score of 8 to 7. It was a big day for the Willys factory force. Besides being the guests of Mr. Willys, the men got a half holiday with pay, and were escorted to the field by six bands.

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Takes Over Bigsby Spark Plug Manufacture

MONTREAL, QUE., June 22—Announcement is made that the National Acme Mfg. Co., Montreal, will take over the manufacture of the Bigsby spark plug in Canada. The Bigsby plug is made by the Bigsby Mfg. Co., Cleveland, O., and has met with great success in the states. C. S. Bigsby, president and general manager of the Cleveland company, was in Canada recently. P. F. Mellinger is the manager of the new Canadian plant.

Singer to Deliver on New $2,500 Six July 15

NEW YORK CITY, June 22.—The Singer Six, Charles A. Singer, Sr.'s new car, is now undergoing road tests, and it is stated by Singer, who is the head of the Singer Motor Co., that the company will be able to begin deliveries about July 15. It is stated that the car has been well received in its specification form, and a brisk business is anticipated during the summer.

By a plan which the company is not yet ready to make public the vehicle will be sold complete with wire wheels and special painting at considerably less than $2,500. Colors are optional with the buyer, as are wood or wire wheels. The company will soon locate Broadway showrooms in New York City.

The car will be built in one regular model with a 135-inch wheelbase. The regular touring body will seat five passengers, and any other type or size will be booked as a special order.

It will have left steer and center control, with the button of the Klaxon on top of the steering column. A German silver radiator with a decided V-front will add a foreign effect, and the hood will taper into the cowl of the streamline body.

Power will be derived from a six-cylinder, T-head, triple-cast, 4-inch bore and 5 1-2-inch stroke Herschell-Spillman motor with an S. A. E. rating of 38.4. A Westinghouse lighting and starting system will be installed, as well as a Taylor Noil power-driven tire pump mounted on the motor. An Eisemann dual high-tension magneto and a three-jet C. R. G. carbureter, on which Singer holds the patents, will be included.

On the dash will be located an electrically lighted Stewart speedometer with Empico drive and an 8-day, keyless Phinney-Walker clock. All gauges are flush, and all the instruments have black dials and nickel rims. A rain-vision ventilating windshield of French plate glass protects the driver. A Pyrene fire extinguisher also will be affixed to the dash.

Axles, front and rear, are Timken. Roller-bearing pivot pins will be incorporated in the front, while the rear axle will be of full-floating silent worm bevel drive construction.

The gearset will be of the four-speed selective type with a dry-plate clutch of fifteen plates, all bolted to the motor base, making a unit power plant. Drive shaft and universals are Spicer.

Tire will be 36 by 4½ front and rear, and wood or Houk wire wheels will be optional without extra cost. A one-man Pantasote top with Jiffy curtains is used.

Canadian Decrease Hurts Export Total

WASHINGTON, D. C., June 20—As reported in a previous issue of THE AUTOMOBILE, the exports of motor cars during April numbered 3,291 machines, valued at $2,833,154, while in April a year ago the number was 2,766 cars, valued at $2,904,224. The exports in April last were divided as follows: Fifty-two commercial cars valued at $72,676 and 3,239 pleasure cars valued at $2,760,478. In April a year ago the number of commercial cars exported was 84 valued at $134,777, while the number of pleasure cars shipped abroad was 2,682 valued at $2,769,447. During the 10 months' period ended April the number of commercial cars exported decreased from 737 valued at $1,333,367 in 1913, to 595 valued at $934,330 in 1914, while the pleasure cars increased from 19,359 valued at $19,333,226 to 23,167 valued at $20,664,480 during the same periods.

The exports of parts, not including engines and tires, increased from $565,667 in April, 1913, to $626,132, in April last, and from $4,153,472 to $5,549,471 during the 10 months' period.

The exports of motor cars, by countries, during the periods under consideration, were as follows:

	APRIL—				TEN MONTHS ENDING APRIL—			
	1913		1914		1913		1914	
	No.	Value	No.	Value	No.	Value	No.	Value
France	144	$ 99,300	311	$ 179,230	645	$ 498,900	1,011	$ 688,471
Germany	108	104,095	234	163,101	500	486,448	1,185	840,448
Italy	43	34,865	59	39,240	271	235,363	293	203,048
United Kingdom	373	292,167	587	514,977	3,120	2,382,752	6,187	4,975,780
Other Europe	262	224,606	500	372,857	1,307	1,132,207	2,241	1,777,826
Canada	1,048	1,326,079	792	865,321	5,967	7,381,109	3,479	4,417,727
Mexico	10	15,950	6	6,830	259	491,871	160	248,497
West Indies and Bermuda	30	28,957	49	53,812	370	382,515	457	437,093
South America	243	287,404	137	104,562	2,438	2,729,313	1,729	1,719,422
British Oceania	169	184,649	276	251,022	2,510	2,361,867	3,353	2,909,643
Asia and other Oceania	201	192,594	211	184,277	1,743	1,672,113	1,875	1,802,247
Other countries	135	113,558	129	97,925	966	912,135	1,792	1,578,608
Total	2,766	$2,904,224	3,291	$2,833,154	20,096	$20,666,593	23,762	$21,598,810

Panoramic view of the Sioux City Speedway, where the 300-mile race which is scheduled for July 3 and 4, will be run

Klinekar Wins 2-Day Hillclimb at Uniontown

Best Time for 3-Mile Ascent is 3.57⅘—Metz Is Second in Non-Stock Free-for-All

UNIONTOWN, PA., June 18.—J. D. Kerr, driving a Klinekar with a piston displacement of 298.5 cubic inches, made the best time in the 2-day hillclimb on the famous 3-mile hill known as "Climb to the Summit," on the military highway, 3 miles east of this town today. This time, 3.57 3-4 minutes, was in the free-for-all, in the second annual hillclimb conducted by the Automobile Club of Fayette County, Pa., which was one of the biggest events held in the state this season, and attracted over 15,000 people, who scattered themselves along the entire 3 miles.

Second best time was made by a Buick, 318.1 cubic inches piston displacement, which made the 3 miles in 3:58 3/5.

Metz with 196 Cu. In. P. D. Does Well

One of the most interesting contenders in the climb was a Metz with 196 cubic inches piston displacement and which made the ascent in 4:04 1/5, winning second place in the last event of the contest, which was for cars of any piston displacement.

Last year the Fayette County Automobile Club staged its first hill climb on the "Climb to the Summit," and it was so successful that a two-day program was scheduled for this year. The first day was for amateur events for members of the club, and the events were only partially successful, due in a measure to the inability of some of the drivers to shift gears properly and so make an interesting climb. The second day's sport was, however, filled with interest, there being eleven starters in the last event, which was a free-for-all. In the event for cars of 451 cubic inches and over there were five starters, and the other two events were well contested.

One of the Worst Hillclimbs in Pennsylvania

The Climb to the Summit is considered one of the worst hill-climb courses in Pennsylvania; the hill is 3 miles, with a total rise of 2,007 feet in this distance. The road is built in the side of the mountain, with a precipice on the right nearly all of the way up. There are many bad curves, the worst being what is known as Turkey's Nest, at a point one-third up. Turkey's Nest is a sharp curve to the right, immediately followed by a bad curve to the left. This curve is all the more dangerous in that it is approached by a 200-yard stretch practically level and which is the only level stretch in the entire 3 miles. The steepest grade on the hill is approximately 12 per cent. Cars were given 100 yards flying start.

One accident happened which was not a part of the hill climb. J. E. Shafer, driver for the Mercer company at Pittsburgh, was driving down the hill between events and when approaching Turkey's Nest apparently lost control of the car when it was traveling at about 18 miles per hour. His hands were seen to drop from the steering wheel, the car veered to the side and struck the rock, throwing the driver out. He died two hours later.

Cash prizes amounting to over $5.000 were awarded. In the free-for-all $650 were given as follows: $300 first, $200 second, $100 third and $50 fourth. In the other events the prizes were from $300 down. The summaries follow:

Thursday, June 18

300 Cubic Inches

CAR—DRIVER	TIME
Klinekar—J. D. Kerr	3:57⅘
Metz—J. McCann	4:00⅗
Mercer—W. L. Cook	4:16

301 to 450 Cubic Inches

Buick—C. W. Johnson	3:58⅘
Buick—A. D. Spencer	4:23
Lozier—P. A. Close	4:46⅕

451 Cubic Inches and Over

Simplex—A. C. Smith	4:09
Mercedes—C. E. Giddings	4:48
Oldsmobile—C. M. Williams	4:48⅘
Packard—H. B. Mertz	4:57⅗
Packard—C. W. Johnson	4:58⅗

Free-for-All Non-Stock

Klinekar—J. D. Kerr	3:57⅘
Metz—J. McCann	4:04⅕
Simplex—I. P. Fetterman	4:20
Buick—A. D. Spencer	4:23
Mercedes—C. E. Giddings	4:45⅗
Lozier—F. J. Schw'zb'gr	4:46⅕
Oldsmobile—C. M. Williams	4:47⅖
Packard—H. B. Mertz	4:55
Maxwell—R. Evans	5:00⅕
Maxwell—E. C. Billings	5:16
Mercer—J. E. Benedict	5:27

Wednesday, June 17

$1,600 and Under Amateur

Buick—W. T. Carroll	5:28⅗
Buick—H. C. Brooke	5:41⅗
Buick—M. Hannon	6:10⅗
Correja—C. H. Cramer	6:31⅖
Buick—K. W. Daily	6:33⅕

$1,601 to $3,000 Amateur

Mercer—R. C. Bigler	4:46
Buick—H. R. Sackett	5:35⅕
Buick—O. P. Powell	5:44⅖

$3,001 and Over Amateur

Lozier—M. Aaron	5:25

Free-for-All Amateur

Mercer—R. C. Bigler	4:41⅖
Buick—O. P. Powell	5:55⅘
Buick—C. E. Wooding	6:12⅖
Haynes—J. P. Roman	6:41

$10,000 Trophy for American Car Winning

INDIANAPOLIS, IND., June 20—To stimulate the interest of American manufacturers in racing, and to prevent a repetition of the victory scored by Europe in the last Indianapolis 500-mile race, the San Antonio, Tex., Auto Club has inaugurated a movement for the establishment of a national, $10,000 trophy, to be offered the next American car winning the event. A substantial sum has been proffered by the club itself, with the suggestion that other subscriptions be called for, through the medium of some prominent trade magazine, as THE AUTOMOBILE.

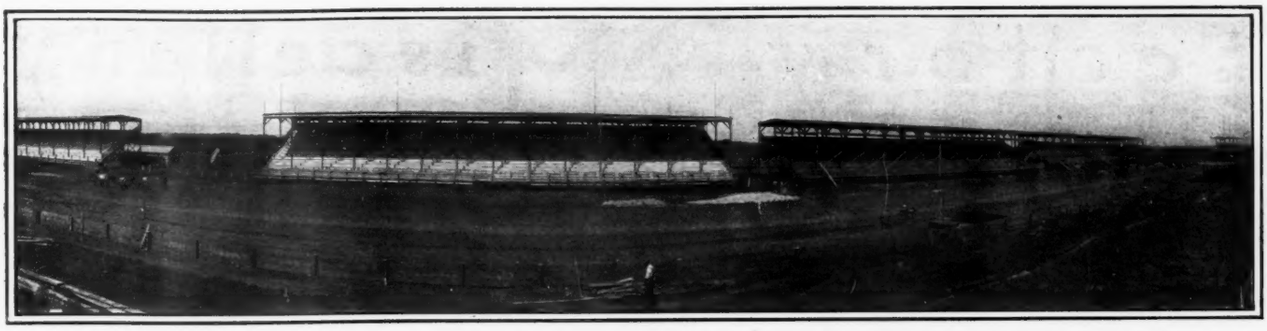
N. Y. Cyclecar Club Wants P. D. Increase

NEW YORK CITY, June 18—At the monthly meeting of the Cyclecar Club of New York, a resolution was passed in which it was stated that the classification of cyclecars should be amended so that the cyclecar sub-division should include all cars up to 100 inches piston displacement, inclusive, and in chassis weight up to and inclusive 950 pounds; and that all cars of 101 to 125 cubic inches piston displacement, and of 951 to 1,150 pounds chassis weight, should be considered the light car class of cyclecars. It was also asked that the small car definition be eliminated entirely from the cyclecar class category.

Racing Stars Encamped at Sioux City

SIOUX CITY, IA., June 22—That the $25,000 Sweepstakes, distance 300 mies, to be run on the Sioux City speedway July 4, will have a maximum field of starters, there is no doubt. Twenty-seven cars are the limit which may be started on a 2-mile speedway and twenty-six entries have been made. The purse for the event is the largest ever hung up for a 300-mile contest, and as was expected, it has lured the best cars and the cream of the drivers to Sioux City.

Bob Burman, the "Speed King," and Ralph Mulford, winner of the 1911 Vanderbilt Cup race and numerous other big races, will be seen at the wheel of the Peugeot cars which showed such sensational speed at Indianapolis. The third Peugeot will be handled by Mel Stringer. Other entries include Billy Knipper, Delage; Barney Oldfield and Gil Ander-



Some of the grandstands at the Sioux City Speedway on which the 300-mile race will be run on July 3 and 4

son, Stutz; Harry Grant and George Babcock, Sunbeams; Spencer Wishart, Mercer; Cyrus Patschke, Marmon; Keene, Beaver Bullet; Wilcox, Gray Fox; Klein, King; Wetmore, Chalmers; Chandler, Braender Bull Dog; Horan, Metropol; Bennet, Moon; two Dusenbergs, one of which will be driven by Rickenbacker; Callahan, Stafford; Bower, National; Brock, Ray; Mason, Mason; and the White car and others with drivers not nominated.

In addition to the 300-mile feature there will be open events staged for which substantial prizes will be hung up. In anticipation of the huge crowds, extra grand stands are being arranged for.

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National Colors for 500-Mile Race

INDIANAPOLIS, IND., June 20—Racing colors in the next Indianapolis 500-mile race, it is announced, will be uniform, according to the nation which a car represents. German machines will thus be white; French, blue; English, green; Belgian, yellow; Italian, red; and American, red and white. This move will do away with the freakish individual color combinations which in the past have marred speedway racing, and at the same time give bolder relief to the international aspect of the sport. Credit for the idea is due E. C. Patterson, the wealthy Chicago sportsman.

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Covers Little Glidden Tour Route

DES MOINES, IA., June 23—Hal R. Wells, of Des Moines, vice-president of the Iowa Automobile Assn., has completed the pathfinding trip for the Iowa Little Glidden Tour which will be run on July 1, 2, and 3 from Des Moines to Sioux City. Arrival in Sioux City will be on the night of July 3 and the tourists will be there in time for the big races at the Sioux City Speedway on July 4.

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Hearing for Garage Separator Case June 26

NEW YORK CITY, June 23—The final hearing before the welfare committee of the board of aldermen on the repeal of the oil separator ordinance, will be held on June 26 at 2 o'clock in the City Hall.

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Carnation Averages 29 Miles to the Gallon

NEW YORK CITY, June 19—A 24-hour non-stop run was completed by a Carnation car on June 18. The little car went 374 miles and averaged 29 miles to the gallon of gasoline at an average speed of a little over 15 miles an hour. The course was from 46th street to 110th street and from Fifth avenue to Broadway.

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NEW YORK CITY, June 22—C. S. Clancy, of San Francisco, Cal., is planning to make a transcontinental tour and a round-the-world journey in a Twombly light underslung car. He expects to leave New York City on July 15 to follow the Lincoln Highway to 'Frisco. By August 25 he expects to be back in New York City and will sail for Europe to make the world tour via Siberia.

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Milwaukee Automobile Club Wins Tour

MILWAUKEE, WIS., June 21—The death of an innocent duck lost the second annual reliability tour between the Milwaukee Athletic Club and the Milwaukee Automobile Club, the latter club winning the contest. The final score was 50 to 34, the winning club making the lesser number of points of demerit. The same club won last year. Included in the set of rules was a regulation as follows: for each animal injured or killed on road, 50 points. Robert Hackett, of the losing club, driving his Cadillac touring car, was unable to avoid a duck waddling across the road during the morning run and killed it, thus suffering the infliction of a penalty of 50 points.

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$5,000 in Prizes Offered at Galveston

GALVESTON, TEX., June 20—It is stated by Fred Pabst, who is in charge of the annual automobile racing events that are to take place on the beach here during the 4 days, ending August 3, that prospects were never brighter for a successful meeting. These beach races have been made a feature of the Galveston Cotton Carnival for several years. A total of $5,000 in prizes are offered. The racing card as officially announced is as follows:

THURSDAY, JULY 30

Event No. 1. Distance 10 miles, Class E, non-stock, for cars of 230 cubic inches and under: First prize $75, second prize $25. Entrance fee $7.50.

Event No. 2. Distance 10 miles, Class D, non-stock, Division 6, for cars of 231 to 300 cubic inches: First prize $75, second prize $25. Entrance fee $7.50.

Event No. 3. Distance 15 miles, Class D, non-stock, Division 7, for cars of 301 to 450 cubic inches: First prize $100, second prize $50. Entrance fee $10.

Event No. 4. Distance 1 mile, Class D, free-for-all, flying start, for Galveston beach mile record: Prize for best time $50; additional $50 prize to winning car if Galveston beach record of 31:11 seconds for flying start mile is lowered. Entrance fee $10.

Event No. 5. Distance 150 miles, Class D, free-for-all race, to be run in three heats, 50 miles to be run each day, with limit of 1 hour to be placed on the first 2 heats, cars to be credited with the distance covered within the time limit each day up to 50 miles; prizes to car making the best time for the 150 miles: First prize $1,500, second prize $750, third prize $300, fourth prize $200, fifth, sixth, seventh and eighth prizes $100 each. Entrance fee $15.

FRIDAY, JULY 31

Event No. 6. Distance 10 miles, dealers' race, Class E, for cars of 231 to 300 cubic inches; open to cars owned by dealers who have been in the business since Jan. 1, 1914: First prize $50, second prize $30, third prize $20. Entrance fee $15.

Event No. 7. Distance 10 miles, dealers' race, Class E, for cars of 303 to 450 cubic inches; open to cars of dealers who have been in the business since Jan. 1, 1914: First prize $50, second prize $30, third prize $20. Entrance fee $15.

Event No. 8. Amateurs' race for Galveston beach cup; distance 10 miles, Class D, open to all amateurs; prize, the massive silver Galveston beach cup. Winning the cup 2 successive years gives permanent possession. Entrance fee $10, will be refunded if the cars entered start.

Event No. 9. Slow race, Class E. Distance ½ mile, free for all amateurs, standing start; cars may be started with low or intermediate gears and must be engaged in high gear before passing a point 50 feet from the tape, remaining in high until the finish; clutch pedals or levers to remain untouched from 50-foot mark to finish. Each car to carry an official observer; stalling the motor will disqualify the car; electric starters to be disconnected after the engine is started before crossing starting tape; last car to cross the tape is declared winner. Prize, Galveston slow race cup. Entrance fee $5.

SATURDAY, AUGUST 1

Event No. 10. Distance 10 miles, Class E, non-stock, for cars of 161 to 300 cubic inches: First prize $100, second prize $25. Entrance fee $10.

Event No. 11. Distance 20 miles, Class E, non-stock, for cars of 450 cubic inches and under: First prize $125, second prize $50, third prize $25. Entrance fee $10.

Event No. 12. Distance 1 mile, Class D, free-for-all, flying start, for world's record: First prize for lowest record $50; additional prize of $150 to car lowering world's record for flying start mile. Entrance fee $5.

Event No. 13. Distance 10 miles, Class E, non-stock, for cars of 230 cubic inches and under: First prize $75, second prize $25. Entrance fee $7.50.

Event No. 14. Distance 150 miles: Second heat of Galveston Cotton Carnival sweepstakes for $3,250 cash prizes.

MONDAY, AUGUST 3

Event No. 15. Distance 10 miles, Class E, handicap: First prize $125, second prize $50, third prize $25. Entrance fee $10.

Event No. 16. Distance 150 miles: Third and last heat of Galveston Cotton Carnival sweepstakes for $3,250 cash prizes.

Event No. 17. Consolation race for non-winning contestants in prior events: First prize $100, second prize $50, third prize $25.

Factory Miscellany

STEARNS TO EXPAND—The F. B. Stearns Co., Cleveland, O., maker of Stearns-Knight cars, will soon erect a factory addition comprising approximately a quarter of a million square feet of floor space. It has become known that the Stearns company has secured title to several large parcels of land just west of its present factory on Euclid avenue. It is the intention to erect a five-story, fireproof brick building with the most advanced methods of lighting, heating and ventilating.

Hawkins Cyclecar Co. Locates—The Hawkins Cyclecar Co., Xenia, O., has acquired the plant of the Baldwin Motor Co., that will be fitted up for manufacturing cyclecars.

Manufactures Piston Rings—The Dayton Piston Ring Co., Dayton, O., was recently organized by P. W. Klinger and others. The company's plant is at Broadway and Chapel road.

Will Manufacture Jacks—The Metzig Bros. Co., Berlin, Wis., wagon and sleigh builders, is equipping its shop for the manufacture of automobile jacks. A daily output of 200 jacks is planned.

Blanket Factory in Norwalk—The Mianus Mfg. Co., Cos Cob, Conn., manufacturer of carriage and automobile robes, plush goods, blankets, etc., will establish a branch factory at Norwalk, Conn., in the old Bishop Mills.

Will Manufacture Tools—Robert Wilde and Arthur P. Emmett are going to organize the Michigan Gear & Engineering Co., in Detroit, Mich., for the purpose of making gear cutting machines and tools, cutting gears and acting as consulting gear engineers.

Rubber Mills Slowing Down—Mill activity at the plants of the rubber companies in Akron, O., is declining and men are being laid off gradually. This is partly seasonable and partly due to reaction from the high record production of the spring months.

Will Manufacture Demountable Rims—Prather Bros., Georgetown, Ky., are planning the establishment of a factory there or in Cincinnati, O., for the manufacture of a demountable wheel for use on Ford automobiles. They have sold their machine shop and garage at Georgetown to R. M. Holland.

Seaman Co. Adds Departments—The W. S. Seaman Co., 480-490 Hanover street, Milwaukee, Wis., builder of automobile bodies, has added a new department for repainting and refinishing cars. A department for building exclusive closed bodies to order has also been established. Heretofore the concern has manufactured bodies in quantities only and is supplying several makers of high-priced cars.

Cadillac Painting Co.'s Plant—The Cadillac Automobile Painting & Trimming Co., located at present at 144 West Congress street, Detroit, has been incorporated, its capital stock now being $50,000. A new plant two stories high 90 by 120 feet, is being erected at the corner of Oakland avenue and East Grand Boulevard. R. A. O'Neill is president and general manager and H. J. O'Connor, secretary and treasurer.

Burlington Co. Makes Deal—The Burlington Blanket Co., Burlington, Wis., making robes, blankets and special motoring styles, has effected an agreement with William Ayres & Sons, Philadelphia, Pa., under which the Ayres will discontinue the manufacture of all shaped blankets at their plants, and these will hereafter be manufactured by the Burlington people. Ayres & Sons will continue the manufacture of lap robes, motoring robes, etc.

Buick Makes More Additions—The Buick Motor Co., Flint, Mich., is still enlarging its plant. Now it is a new three-story enamel plant which is in course of construction, and which, when completed will be probably the largest of its kind in the automobile industry. The new structure will be 108 by 265 feet; there will be fifteen ovens and two high-speed electric elevators of 4,000 pounds capacity. In addition to the standard equipment of the modern enameling plant there will be installed a monorail system for moving the raw material and the finished product to the various parts of the factory. The structure is to be completed by October 1.

Oldberg to Move—The Oldberg Mfg. Co., which makes automobile, marine and stationary mufflers, now located at Beaubien and Champlain streets, Detroit, Mich., will move in a few weeks into its new plant on Forest avenue, a three-story modern fireproof structure 60 by 120 feet. Only 5 years ago the concern started in business and ever since it has been growing until its present quarters have become entirely inadequate. "We are making 400 to 500 mufflers a day but could do much better," said A. C. Born, secretary-treasurer of the Oldberg company, "were it not for our present cramped quarters. We find business conditions very good and have more orders on our books at the present time than we had all of last year."

The Automobile Calendar

June 23-26	S. A. E. Summer Meeting, Cape May, N. J., Cape May Hotel.
June 24-26	Chicago, Ill., Seventh Annual Meeting of Nat. Gas Engine Assn.
June 27-July 4	A. A. A. Touring Week.
June 27	Brooklands Track, England; Annual Automobile Race.
June 30	London, Eng., Fourth International Rubber and Allied Industries Congress.
July 2, 3, 4	Denver, Colo., 270-Mile Consistency Race.
July 3-4	Tacoma, Wash., Montamara Festo Races, Tacoma Speedway Assn.
July 4	Utica, N. Y., Hill Climb, Auto Club of Utica.
July 4	Visalia, Cal., 150-Mile Road Race.
July 4	Prescott, Ariz., Road Race, Prescott Auto Club.
July 4	Sioux City, Iowa, 300-Mile Race, Sioux City Auto Club and Speedway Assn.
July 4	Lyons, France, French Grand Prix.
July 4-5	Chicago, Ill., Track Meet, Hawthorne Track.
July 13-14	Seattle, Wash., Track Races, Seattle Speedway Assn.
July 25-26	Belgium Grand Prix Road Races.
July-August	French Army Truck Subsidy Trials.
Aug. 1-3	Galveston, Tex., Beach Races.
Aug. 2-9	Grenoble, Automobile Club of France's 6-Day Motorcycle and Cyclecar Reliability Contest in French Alps.
August 16	Le Mans, France, Automobile Club de la Sarthe's Coupé International Light-Car Race, 1 liter, 400 maximum cylinder area, 350-500 kilos weight.
Aug. 17	Le Mans, France, Auto Club de la Sarthe's Grand Prize de France for 4½ liter cars.
Aug. 21-22	Chicago, Ill., Elgin Road Races, Chicago Automobile Club.
Aug. 23	Auvergne, France, Coupé de l'Auto Race.
Aug. 27	Brooklands Track, England; Annual Automobile Race.
Aug.	Russia, Road Race, Coupe de l'Empereur, 2,500 miles.
Sept. 6-7	Brescia, Italy, Auto Club of Italy's 4½-liter Grand Prize.
Sept. 7-14	Indianapolis, Ind., Automobile Show, Indianapolis Automobile Trade Assn.
Sept. 9	Corona, Cal., Road Race, Corona Auto Assn.
Sept. 10-15	Berlin, Germany, German 4½-liter race.
Sept. 26	Brooklands Track, England, Annual Automobile Race.
Sept. 26-Oct. 6	Berlin, Germany, Automobile Show.
Oct.	Philadelphia, Pa., E. V. A. A. Annual Convention.
Oct. 7-17	New York City, Electric Vehicle Show, Grand Central Palace.
Oct. 9-Nov. 2	S. A. E. European Trip.
Oct. 16-26	Paris, France, Automobile Salon.
Oct. 17-24	Pittsburgh, Pa., Automobile Show, Auto Dealers Assn., Inc.
Oct. 19, 20, 21	Philadelphia, Pa., Elec. Veh. Assn's Convention.
Oct. 19-26	Atlanta, Ga., American Road Congress of the American Highway Assn. and the A. A. A.
Oct. 28-31	Milwaukee, Wis., Convention, Northwestern Road Congress, Auditorium.
November	El Paso, Tex., Phoenix Road Race, El Paso Auto Club.
Nov. 6-14	London, England; Olympia Show.
November 8-11	Shreveport, La., Track Meet, Shreveport, Auto Club.
November 15	Paris, France, Kerosene Motor Competition.

The Week in the Industry

Motor Men in New Roles

GEORGE DAVIS Joins Knox—Coincident with the formation of the new Knox Motors Co., Springfield, to take over and extend the business of the Knox Automobile Co., of Springfield, Mass., announcement has been made of the appointment of G. M. Davis as assistant sales manager of the new company. Mr. Davis was with the Pierce-Arrow company, Buffalo, N. Y., for 4 years and recently has been identified with Packard interests at Albany. C. F. Barrett has been advanced to the position of advertising manager of the new Knox company, the plans for the organization of which contemplate the practical combination of the sales and advertising departments.

Woodward Joins Dodge Bros.—O. J. Woodward has been appointed a district sales representative, with headquarters in Chicago, for Dodge Bros., of Detroit.

Stevens Advanced—A. C. Stevens, well known as superintendent of the Winton company, Seattle, Wash., has recently been advanced to assistant sales manager of that company.

Adams Ideal Truck Sales Manager—Lyle Adams, former sales manager of the Adams Bros. Co., Findlay, O., has accepted a similar position with the Ideal Motor Truck Co., Fort Wayne, Ind.

Peak Heads Oakland Branch—George Peak, well-known automobile salesman of San Francisco, has taken charge of the retail department of the San Francisco, Cal., branch of the Oakland Motor Co.

Flannery K. D. Carbureter Manager—The K. D. Carbureter Co., Cleveland, O., has appointed J. M. Flannery manager of its branch in Detroit, Mich., with headquarters at 650 Woodward avenue.

Parker Quits Motor Business—Frederic E. Parker, for the past 15 years identified with automobile companies in Boston, Mass., has gone into the real estate and insurance business in that city.

Pitts Wagenhals Sales Manager—The Wagenhals company, Detroit, Mich., manufacturer of the three-wheel Wagenhals automobile, has appointed A. J. Pitts, a Detroit newspaper man, as its general sales manager.

Crockett Sales Manager—F. H. Gross has taken the agency for the Lyons-Knight cars in Boston and he has opened salesrooms at 16 Columbus avenue. Burleigh N. Crockett has been made sales manager of the new company.

Davis Makes a Change—Nelson A. Davis, founder of the Davis Automobile Co., Providence, R. I., has retired from that company and he has gone into business alone, taking the agency for the Locomobile cars in Rhode Island.

Henry with Dodge Bros.—C. W. Henry, formerly with the Diamond Rubber Co., and the Woods Motor Vehicle Co., is now with Dodge Bros., Detroit, Mich., who have appointed him as their representative in Indianapolis, Ind.

Fred Wagner in Motor West—A deal has recently been closed whereby Fred. J. Wagner will be associated with Frederic Pabst in the publication in California of *Motor West*,

McDermid Resigns—W. A. McDermid has resigned as sales manager and secretary of the Falcon Cyclecar Co., Staunton, Va., to become advertising manager of the Gerhard Mennen Chemical Co., Newark, N. J., retaining his financial interest in the cyclecar company. He will assume his new duties on July 1.

Schumacher Getting Truck Data—E. L. Schumacher, traffic engineer of the Federal Motor Truck Co., Detroit, Mich., will visit all the large cities in the country and gather data on the actual haulage work of various concerns in various lines of business. One of the first cities to be canvassed will be Indianapolis, Ind., where he will gather all the information possible about the bus and transfer lines which use a large number of horses and wagons.

Gogarn Advertising Manager—N. B. Whitfield, dealer in Overland Apperson and Premier cars in New Haven, Conn., has engaged J. W. Gogarn as sales and advertising manager. Mr. Gogarn recently completed his tenth successive year as advertising manager for R. M. Owen & Co., the former general selling agency for the Reo company. In addition to directing the sales and advertising for Mr. Whitfield, he will act as general distributor for Ajax tires in that city.

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Garage and Dealers' Field

J-M's Duluth Office Moves—The Duluth, Minn., office of the H. W. Johns-Manville Co. has moved to larger quarters at 327 West First street, in order to take care of its increased business in that city.

Appointed Acme Tire Distributor—Milwaukee, Wis.—The Consumers' Tire Co., Seventh and Wells streets, Milwaukee, Wis., has been appointed exclusive distributor for Acme tires and accessories. This line formerly was carried by the Billings Auto Tire & Supply Co., which has left the field.

Buick Wins Silver Trophy—On Tuesday, May 26, a 1914 B-25 Buick touring car, in charge of Joe Schmidli and Claude McGee of the Howard Automobile Co., of San Francisco, won the Silver Trophy cup for 1914, offered by the Tahoe Tavern to the first automobile to cross the Sierra Nevada mountains over the Emigrant Gap State Road under its own power.

Sparks-Withington Heads Entertained—The heads of the various departments of the Sparks-Withington Co., automobile parts manufacturers in Jackson, Mich., were entertained in Detroit, June 13, by President William Sparks and the other officers of the company. Places worth while seeing in Detroit were visited, a banquet was served at the Wolverine Automobile Club and a theater party followed.

Garage Men May Combine—There is talk now in Worcester, Mass., of a combination of the garage men there so that some sort of a price schedule may be worked out that will meet the approval of all firms in the business. The new garage law will eliminate a number of garages in the Bay State by October 1 next, and it is proposed to get some organization worked out so that those remaining in business may arrange rates that will be standard.

Grinnell Makes Detroit Lease—Owing to the development of its business the Grinnell Electric Car Co., of Detroit, has secured the lease on the entire building at 477 Woodward avenue, corner of Bragg street. After some alterations have been completed the Grinnell company will occupy a space 40 by 40 feet at the corner of Bragg for salesroom purposes, and the rear of the building, which is 130 by 120 feet, will be used as garage. Part of the building will be sublet to other concerns.

Cyclecar to Run in Desert—The cyclecar is soon to invade the Syrian desert. Philip Maloof of Beirut, Syria, who is in this country to establish agency connections with American automobile factories for Egypt, Beirut, Hallap, and parts of Asia Minor, has taken the agency for a cyclecar built at Auburn, Ind. He will attempt to carry mail with the narrow-tread vehicle over the ancient desert routes of the Holy Land. He believes that the journey, which now takes three weeks by camel and horse, can be made in a week at most by cyclecar.

Inaugurates New Guarantee System—Leo E. Mann, Saginaw, Mich., automobile accessories dealer and agent for the Federal tires has inaugurated a new system of personal guarantee to purchasers of Federal tires. On all complete tires—case and tube—sold together at list price, less 5 per cent. cash discount, and used together, Mann agrees to repair, gratis, all punctures, fabric breaks due to stone bruises, or other injuries, or cuts extending through carcass or to the second ply of fabric, providing same are received during the period of 60 days from date of purchase. The system is working out to Mann's satisfaction and that of his customers.

Farmers Buying More Machines—Firms manufacturing agricultural implements have noted a gradual decrease in business during the past 5 years. They say that with the increase in the number of automobiles owned by farmers has come a proportionate decrease in the investment in farm machinery. Formerly each farmer bought one to two new pieces of machinery each year. That money is now being placed in automobiles and accessories. Farm machinery is being required to give longer service and only standard machines are being used. In addition, farmers are giving their machinery better care, realizing that with automobiles the machinery must last longer.

Automobile Agencies Recently Established

PASSENGER CARS

Place	Car	Agent
Alma, Kan.	Maxwell	G. A. Mueller
Albert Lea, Minn.	Maxwell	Hellie Auto Co.
Altoona, Ia.	Maxwell	H. B. Blakely
Anthon, Ia.	Maxwell	Anthon Auto Association
Arcadia, Fla.	Chandler	S. I. Simmons
Arthur, N. D.	Maxwell	Arthur Mercantile Co.
Atwood, Kan.	Maxwell	Youngblood Auto Repair Co.
Barbourville, Ky.	Krit	Walter Barner
Barnard, Kan.	Maxwell	H. J. Hibler
Beardstown, Ill.	Chandler	John E. Parks
Belleville, Ill.	Maxwell	Charles Procasky
Birmington, Ala.	Chandler	Birmington Garage
Bluefields, W. Va.	Maxwell	R. H. Henderson
Bracken, Tex.	Chandler	Chas. Rimshagen
Bridgeport, Ill.	Chandler	W. B. Gray & Son
Brookville, Miss.	Maxwell	Madison Hambrick Auto Co.
Burlington, Colo.	Maxwell	Scofield & Hoskin
Burlington, Kan.	Maxwell	Z. T. Grant & Son
Burwell, Neb.	Maxwell	G. R. Key
Cadillac, Mich.	Maxwell	H. N. Reinberg
Caledonia, Mo.	Maxwell	R. R. Bean
Canfield, O.	Maxwell	Canfield Auto & Supply Co.
Canton, Kan.	Maxwell	N. G. Alldritt
Casper, Wyo.	Maxwell	Casper Mach. Shop & Garage.
Catskill, N. Y.	Maxwell	Amos Post
Centralia, Mo.	Maxwell	Roberts Bros. & Green
Cheriton, Va.	Chandler	R. A. Wise
Chilhowee, Mo.	Maxwell	Strawsburg & Bugard
Clare, Mich.	Maxwell	A. Roe
Clarkshill, Ind.	Maxwell	McKinney & Mugg Auto Co.
Coffeyville, Kan.	Franklin	Franklin Motor Car Co.
Colesburg, Iowa	Maxwell	Pech & Kocher
Columbus, Miss.	Maxwell	T. W. Townsend
Conem, Mich.	Maxwell	F. B. Raymond
Cottonwood, Cal.	Maxwell	Frank Butterway & J. E. Dilley
Dryer, Tex.	Maxwell	B. F. Schumacher
Earlville, Ill.	Maxwell	Chas. H. Sellers
Elba, Mich.	Maxwell	John S. Smith
Elizabeth City, N. C.	Maxwell	Oliver F. Lane
Ely, Nev.	Chandler	Leak
Emerald, Wis.	Maxwell	Geo. D. Love
Enterprise, Ore.	Maxwell	Enterprise Garage & Auto Co.
Estevan, Sask.	Maxwell	Frederick & Green
Farmersbury, Ind.	Maxwell	W. D. Bolinger Co.
Farnhamville, Ia.	Maxwell	Jihnson Auto Co.
Fort Collins, Col.	Maxwell	Howard E. Smith
Fort Wayne, Ind.	Chandler	H. G. Raymond & Co.
Fossil, Ore.	Maxwell	Fossil Mercantile Co.
Fraser, Col.	Maxwell	W. E. Fenstermacher
Gananoque, Ont.	Maxwell	W. J. Gibson
Gary, Ind.	Chandler	John A. Brennon
Georgetown, Idaho	Maxwell	C. W. Hess
Glasgow, Ky.	Ford	Bradford Bros.
Glencoe, Ky.	Maxwell	C. P. Beatty
Grand Junc., Ia.	Maxwell	W. W. Kirby
Great Falls, Mont.	Maxwell	Johnson Motor Sales Co.
Greely, Col.	Maxwell	Greely Garage
Greenville, Pa.	Chandler	Quinton J. Burnett
Guernsey, Wyo.	Maxwell	W. L. Diver
Hackensack, N. J.	Maxwell	Hackensack Auto Co.
Harbor Bch., Mich.	Maxwell	Dell McMann
Harrison, Ark.	Maxwell	Frew Saddlery Co.
Hazleton, Pa.	Chandler	G. W. Wilmont
Hiawatha, Kan.	Chandler	G. C. Willis
Hudson, N. Y.	Maxwell	Crescent Garage
Indio, Cal.	Maxwell	Goldie Summers
Jackson, Tenn.	Chandler	Wm. Glenn, Jr.
Jewell, Kan.	Maxwell	C. E. Ohlinger
Kalamazoo, Mich.	Maxwell	Frank Lems
Kiowa, Kan.	Maxwell	Benton & Ives
Kirkman, Ia.	Maxwell	Edgar Larson
Kutztown, Pa.	Chandler	J. Raymond Augstadt
La Grange, Ga.	Maxwell	Pharr Bros., Childs & Callaway
La Grande, Ore.	Maxwell	W. H. Bohnenkamp & Co
Las Animas, Col.	Maxwell	T. H. Marshal
Lebanon, Ky.	Hupmobile	Ivo L. Canary
Lewisburg, Tenn.	Maxwell	Green Bros. & Chum
Lima, O.	Lozier	Miller Garage
Lima, O.	Maxwell	Lima Garage
London, Ont.	Chandler	Central Garage Co.
Long Beach, Cal.	Maxwell	J. S. White & H. W. Judson
Mart, Texas	Maxwell	W. L. Lowry
Martinsville, Ill.	Maxwell	Grover Decker
Meade, Kan.	Maxwell	Meade Motor Co.
Medicine Hat, Alta.	Franklin	Diehl Motor Car Co.
Medicine Lodge, Kan.	Maxwell	W. E. Benefiel Hdw. Co.
Millington, Mich.	Maxwell	D. J. Evans
Milwaukee, Wis.	Hudson	Jesse A. Smith Auto Co.
Minneapolis, Minn.	Alter	Bob Brice
Monmouth, Ill.	Maxwell	U. M. G. Geffery & J. M. Lamney
Montreal, Que.	Keeton	Gareau Motor Car Co.
Morristown, Wis.	Maxwell	Falck & Groth
Murray, Utah	Chandler	E. Carlson
Narka, Kan.	Maxwell	Holechek Bros.
New Milford, Conn.	Maxwell	Arcade Machine Works
Normandy, Ky.	Maxwell	C. V. Stout
North Yakima, Wash.	Grant	Bellingham Implement of North Yakima
North Jay, Me.	Maxwell	A. R. & E. N. Kyes
Opp, Ala.	Maxwell	A. T. Dean
Oshkosh, Wis.	Maxwell	Oshkosh Auto Co.
Overbrook, Kan.	Maxwell	Radcliff & Son
Palisley, Ore.	Maxwell	J. P. Cruzan
Paola, Kan.	Maxwell	Lehr & Gardner
Patch Grove, Wis.	Maxwell	West Grant Auto Agency
Pella, Ia.	Maxwell	Ever-Ready Auto Co.
Perthshire, Miss.	Chandler	S. D. Knowlton
Plainfield, N. J.	Chandler	E. & C. Auto Co.
Port Jervis, N. Y.	Maxwell	Rutan Auto Co.
Portland, Ark.	Chandler	Bain-Adams Co.
Portland, Ore.	Haynes	Nob Hill Garage
Port Richmond, S. I., N. Y.	Maxwell	I. A. Silvie, Jr.
Poughkeepsie, N. Y.	King	Horace Sague & Son
Providence, R. I.	King	Gilbert Williams
Port Chester, N. Y.	King	Lowden & Flint
Punxsutawney, Pa.	Franklin	Whiteman & Co.
Ozana, Tex.	Chandler	S. E. Couch
Racine, Wis.	Grant	C. J. Nelson
Racine, Wis.	Lewis Six	Milton E. Laux
Racine, Wis.	Maxwell	Spencer Hall
Random Lake, Wis.	Case	Wm. C. Mertz
Random Lake, Wis.	Ford	Wm. C. Mertz
Ravena, N. Y.	Maxwell	Joralemon Bros.
Ray, Ind.	Maxwell	McNaughton & Warner
Reading, Pa.	Moon	Crawford Auto Motor Co.
Red Bluff, Cal.	Maxwell	A. A. Curtis
Reedsburg, Wis.	Buick	Townsend & Kenney Co.
Reedsburg, Wis.	Ford	Townsend & Kenney Co.
Reedsburg, Wis.	Jeffery	Townsend & Kenney Co.
Reedsburg, Wis.	Overland	Townsend & Kenney Co.
Reedsburg, Wis.	Studebaker	Townsend & Kenney Co.
Regent, N. D.	Maxwell	Show & Boe
Reynolds, Neb.	Maxwell	R. A. Bothwell
Rhinelander, Wisc.	Maxwell	T. C. Wood Hdw. Co.
Richfield, Ill.	Chandler	G. E. Brubaker
Ridgway, Mo.	King	Curtis & Francis
Robinson, Ill.	Moon	Geo. F. Allison
Rocky Mt., N. C.	Maxwell	B. H. Johnson
Rolette, N. D.	Maxwell	I. S. Berg & Brother
Roseville, O.	McFarlan	Roseville Garage
Roswell, N. M.	Maxwell	Cummins Garage
San Bernardino	Maxwell	Firth Crossland
San Luis Obispo, Cal.	Maxwell	Union Hdwe. & Plumering Co.
Santa Barbara, Cal.	Maxwell	E. J. Boescke, Jr.
Saranac Lake, N. Y.	King	ShellyTool Co.
Sarnia, Ont.	Franklin	Hitchcock & Richardson
Savannah, Ga.	Maxwell	N. H. Gilsdorf
Schenectady, N. Y.	King	Schenectady Welding & Repair Co.
Scotia, Neb.	Maxwell	Earl W. Daily
Scotland Neck, N. C.	Maxwell	S. B. Kitchen
Scotland, S. D.	Maxwell	William Catton
Scranton, Pa.	Chandler	Bishop Bros.
Scranton, Pa.	King	Lackawanna Auto Co.
Seneca, Kan.	Maxwell	J. J. Buser Auto Co.
Seneca, S. C.	Maxwell	J. L. Lawery
Shawnee, Okla.	Franklin	Auto Supply & Garage Co
Shellman, Ga.	Maxwell	S. Shelfield
Shelter Island, N.Y.	King	Geo. B. Wells
Shenandoah, Pa.	King	R. H. Morgan
Shickley, Neb.	Maxwell	Elmer Johnson
Shreveport, La.	Maxwell	Lawrence & Embry
Silex, Mo.	Maxwell	Silex Grain Co.
Sisterville, W. Va.	Franklin	Diamond Garage Co.
So. Elliot, Me.	King	George Athorne
Smithfield, N. C.	King	Simon B. Jones
Sonora, Cal.	Maxwell	W. H. Sharp
Spartanburg, S. C.	Maxwell	W. J. Johnson
Spokane, Wash.	Haynes	Rose & Williams
Spokeville, Wis.	Maxwell	Gerdes & Voigt
Springfield, Mass.	Moon	Moon Motor Sales Co.
Springfield, Mo.	King	H. E. Seely
Springfield, Ill.	Chandler	Van Buyn & Mathys
Sprucer, Ind.	Maxwell	A. C. Williams
Stanberry, Mo.	King	Welch & Enyart
St. Charles, Mo.	Maxwell	St. Charles Garage
St. Joseph, Mo.	King	Henry Kimmet
St. Louis, Miss.	Lex.-Howard	Edrus Auto Co.
St. Louis, Miss.	Oldsmobile	DeLuze Automobile Co.
Stewartville, Minn.	Maxwell	F. L. Hodgson
St. John, Kan.	Maxwell	St. John Auto Co.
St. Genevieve, Mo.	Maxwell	F. X. & A. J. Siebert
Summitville, N. Y.	Maxwell	F. C. Schindler
Sunbury, Pa.	Franklin	H. O. Bateman & Co.
Sylvia, Kan.	King	G. A. McPherson
Taft, Cal.	Maxwell	Krull & Jones
Tarkio, Mo.	Maxwell	Tarkio Auto Co.
Thomasville, Ala.	Maxwell	Thomasville Mill & Storage Co.
Thompsonville, Conn.	King	Douglass & Barley
Tonopah, Nev.	Maxwell	Kelly & Campbell
Topeka, Kan.	King	W. T. Dawson Auto Co
Troy, N. C.	Maxwell	G. W. Allen & Sons
Tulsa, Okla.	King	Williams & Staup
Vernal, Utah	Maxwell	Frank C. Griffin
Verona, Ill.	Franklin	John F. Stitt
Victoria, Tex.	Maxwell	F. L. Sterne
Walbridge, O.	Saxon	F. J. Schriber
Wapakoneta, O.	King	W. G. Taylor
Waverly, Va.	Chandler	V. C. Johnson
Wellsboro, Pa.	Maxwell	Evens & Snyder
Wenatchee, Wash.	Maxwell	Louis Adams
Westfield, Ill.	Maxwell	Floyd Barbee
Westfield, N J.	Chandler	H. L. Fink
W. Hampton Beach, L. I.	King	E. A. Case
West Jefferson, O.	Maxwell	Johnston & Pennybaker
West Newton, Pa.	Maxwell	Adams & Robinson
White Plains, N. Y.	King	Bernard Hopp, Jr.
Wichita Falls, Tex.	Chandler	Brown & Ellinger
Wichita, Kan.	Maxwell	Raffety & Rodda
Willsboro, N. Y.	King	Dr. L. G Barton
Wilson, Kan.	Maxwell	Weber & Co.
Winfield, Kan.	King	A. E. Hudson
Woodland, Ga.	Maxwell	U. B. Jordan
Worcester, Mass.	King	Maynard Rubber Co.
Worcester, Mass.	Maxwell	Worcester Auto Co.

CYCLECARS

Place	Car	Agent
Louisville, Ky.	Dudley Bug	Geo. Fetter
Louisville, Ky.	Merz	J. R. Anderson
Louisville, Ky.	Zip	National Cyclecar Co.
Portland, Ore.	Mercury	C. Van B. Redman & John McKie
Tacoma, Wash.	Dudly	R. Ely Breckenridge
Viroqua, Wis.	Rayfield	Harman S. Hanson

COMMERCIAL VEHICLES

Place	Car	Agent
Alexandria, La.	Koehler	W. Lennie Smith
Bridgewater, Mass.	Koehler	Bridgewater Inn Garage
Dothan, Ala.	Koehler	W. L. Brown
Louisville, Ky.	Koehler	Strube's Garage
Milwaukee, Wis.	Seldon truck	Ralph Temple Auto Co.
Minneapolis, Minn.	Dart	Minndakota Cycle Co.
New Bedford, Mass.	Koehler	Ed. L. Waybrant
Steubenville, O.	Koehler	J. H. Timberlake

Recent Incorporations in the Automobile Field

AUTOMOBILES AND PARTS

BINGHAMTON, N. Y.—Canfield Gas Engine Co.; capital, $50,000; to manufacture gas engines. Incorporators: William J. Newing, A. Louis Newing, Elmer L. Whitlock.

CLEVELAND, O.—Alday Mfg. Co.; capital, $10,000; to manufacture motors and engines. Incorporators: H. A. Hauxhurst, M. T. Flanagan, F. X. Cull, Richard Inglis, V. Svancar.

CLEVELAND, O.—Hudson Motor Sales Co.; capital, $25,000; to deal in automobiles and accessories. Incorporators: C. W. Comstock, L. A. Kraus, J. C. Royon, M. T. Gorton and F. M. Wolke.

COLUMBUS, O.—Dunlap Electric Truck Co.; capital, $20,000; to manufacture and deal in electric motor trucks and accessories. Incorporators: T. C. Dunlap, George R. Hedges, Stewart A. Hoover, Herman R. Tingley and M. E. Heasley.

DAYTON, O.—Dayton Overland Sales Co.; capital, $30,000; to deal in automobiles and supplies. Incorporators: Charles H. Bosler, Robert Rouch, Herbert S. Allen, Charles L. G. Breene and Gena Cross.

GARY, IND.—Gary Auto Mfg. Co.; capital, $50,000; to manufacture automobiles. Incorporators: G. E. Paff, L. G. Throckmorton, W. C. Flanagan.

NEW YORK CITY—Eastern Parts Mfg. Co.; capital, $6,000; to manufacture parts for automobiles and motorcycles. Incorporators: Benjamin Frankel, Gerson C. Young, Julia Greenthal.

NEW YORK CITY—Stokes Carbureter Co.; capital, $100,000; to manufacture carbureters. Incorporators: John F. Smith, William O. Stokes, Tillie M. Stokes.

RACINE, WIS.—George W. Jagers Mfg. Co.; capital, $295,000; to build small high speed motors. Incorporator: George W. Jagers.

UTICA, N. Y.—J. A. Cowley Auto Co., Inc.; capital, $1,000; to deal in automobiles. Incorporators: John Owen, Jas. A. Cowley, Jas. A. Cowley, Jr.

GARAGES AND ACCESSORIES

BROOKLYN, N. Y.—St. Mark's Garage, Inc.; capital, $10,000. Incorporators: Domenico Saladino, August Quick, M. Quick.

CINCINNATI, O.—Archiable-Brouse-Parker Co.; capital, $5,000; to repair automobiles and other machinery. Incorporators: Henry M. Brouse, W. H. Parker, R. J. H. Archiable, William R. Parker and Gerrit J. Frederick.

CINCINNATI, O.—Automobile Livery Co.; capital, $1,000; to operate a taxicab and livery business. Incorporators: William C. Jungelas, John C. Johannigman, J. A. Duchemin, A. Heinzman and Gertrude Fennierman.

CINCINNATI, O.—Main Auto Machine Co.; capital, $5,000; to operate a repair shop. Incorporators: G. D. Haynes, J. N. Weber, Nicholas Weber, William Reiker, Gerritt J. Frederick.

CLEVELAND, O.—The Telescopic Fender Co.; capital, $50,000; to make automobile accessories. Incorporators: C. L. Weiseil, Arthur Sharp, R. E. Dickson, H. M. Dolan, E. D. Sabin.

DETROIT, MICH.—Central Garage Co.; capital, $20,000. Incorporators: Gustave E. Le Veque, Percy C. Brown, Frank D. McCormick and Seymour Finney.

DETROIT, MICH.—Lininger-McHugh Co.; capital, $10,000; to manufacture automobile accessories. Incorporators: William Lininger, Philip A. McHugh.

GRAND RAPIDS, MICH.—Tisch Auto Supply Co.; capital, $20,000; to deal in automobile supplies. Incorporators: J. Tisch, E. Tisch.

LOUISVILLE, KY.—Kentucky Auto Supplies Co.; capital, $2,500; accessories. Incorporators: F. T. Hinkle, L. A. Hemline, R. V. Nordeman, Paul B. Collins.

NEW YORK CITY—Tubine Co., Inc.; capital, $10,000; tire fillers, repairs, etc. Incorporators: Osmar S. Burr, Achille Brile, Fred Rosenbaum.

NEW YORK CITY—W. J. Donnelly and Co., Inc.; capital, $500; to deal in auto accessories, etc. Incorporators: V. C. Bogardus, F. B. Dobbin, E. C. Hobroft.

PORTLAND, ORE.—Portland Garage; capital, $15,000. Incorporator: Frank Kiernan.

Accessories for the Automobilist

M'CORMICK Weatherstrip—A. L. McCormick of Louisville, Ky., is the inventor of a weatherstrip, Fig. 1, which closes the space between the upper and lower halves of all rain-vision windshields, thereby eliminating the possibility of rain coming through this space to the great inconvenience and annoyance of those occupying the front seat. The strip is so designed that it will adjust itself to all shields regardless of the thickness of the glass or the space between the upper and lower glasses.

The lower part is a channel fitting over the edge of the lower glass holding the strip in place regardless of the position of the upper glass. The dotted lines show the natural position of the flange. When the upper glass is in a vertical position the edges of the upper and lower glasses being opposite, the flange presses against the outer surface of the glass, making a water-tight connection between the two panes. The width of the strip being less than an inch the vision is not interfered with. The strip may be easily removed and carried under seat or in pocket of car or left in place permanently.

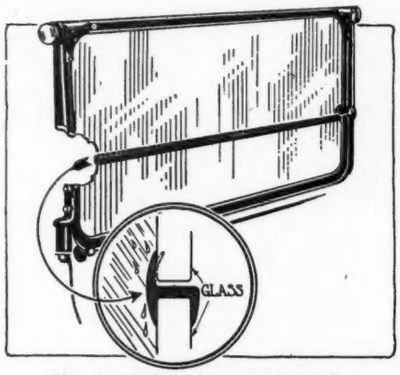

Fig. 1—McCormick weatherstrip

Oxylene Cartridges—The Oxygen Decarbonizer Co., Detroit, Mich., has brought out an oxygen burning outfit in which a generator is used to furnish gas. This step is due to the fact that sometimes it is not convenient to obtain or handle large oxygen tanks under a pressure of 1,800 pounds per square inch.

The outfit consists of the usual hose and connection for conducting oxygen into the cylinder, and an oxygen generator, which is so proportioned that it will generate the proper amount of gas at the correct rate for cylinder cleaning. The cartridge is a seamless drawnsteel drum which acts as a retort as well as a shipping package.

Fig. 2 shows the simplicity of the apparatus, which is made in three parts, together with the necessary valves, and copper and rubber tubing. The short upper cylinder is the purifier, from which the oxygen emerges in a pure dry state. The section beneath is the cartridge and below that is the heating unit consisting of a furnace provided with a wall of heating-resisting material.

By this system the owner of an Oxylene outfit needs only to purchase a new Oxylene cartridge. The cartridges are shipped ready prepared with the chemicals from which the oxygen is produced and the gas begins to form the moment the heater is lighted.

Each cartridge contains sufficient chemicals to furnish all the oxygen needed to decarbonize a four-cylinder motor of the usual size. As the cost of the cartridge is $1.50, while the regular charge for decarbonizing a motor with oxygen is $1 per cylinder, there is a large profit to be made by the dealer.

Perpetual Gas Saver—A saving in gasoline by admitting more air to the mixture and an increase in power because better vaporization is secured are the points claimed for the Perpetual Gas Saver, Fig. 3, which has for its main feature a double air control. One is automatic, being connected to the throttle lever, and the other is manual, being actuated by a small lever at the top of the steering column. For ordinary running the automatic control is used, but when desired the hand lever may be operated. This is of special advantage when the motor is being used as a brake, as then the hand control valve can be opened wide so that the motor pumps nothing but cool, pure air instead of gasoline and air, as is usual.

The hand valve is operated by means of the cable attached to the lever A, while the throttle controlled valve is operated through a linkage connected up with the lever B.

The device is manufactured by Ratliff & Watkins, Riverside, Cal., and the price is $6.

Miller Three Minute Cement—Drying and vulcanizing perfectly in 3 minutes, the new vulcanizing cement manufactured by the Miller Rubber Co., Akron, O., it is claimed, makes it possible for motorists to have tube repairs done and be on their way 10 minutes from the time they reach the repair shop.

This is the fastest curing adhesive presented to the trade. It is known as Miller Three Minute Cure Vulcanizing Cement, and is used in connection with the Akron company's tube repair gun, which also has the rapid curing feature.

Peerless Magnet Charger—The Seanor Garage Magnet Recharger, the invention of H. E. Seanor, Rock Island, Ill., and which was described in THE AUTOMOBILE for June 18, on page 1276, is to be manufactured by the Peerless Mfg. Co., 1516 Fourth avenue, Rock Island, Ill. The device is to be known as the Peerless Magnet recharger.

Entorf Gasoline Filler—To separate the gasoline from the water which it sometimes contains the Entorf Filter Co., Amboy, Ill., has produced the Entorf water-separating filter. In appearance it resembles the common tin funnel, but near the top it is screened so fine that when oil is poured upon it a film is formed through which water will not pass. Above this screen is an opening into a drain duct or vent on the outside of the filter which water can enter. Below the first screen is a second one and another opening into the drain duct. At the bottom of the filter is a mechanical device so arranged that the oil will pass through into the spout, while the heavier substances will go into a reservoir which discharges into the drain duct. After the desired quantities of oil or gasoline has been poured through the filter the water and other impurities can be poured out by tilting the filter downward.

Dahlstrom Metallic Mouldings—Metal mouldings for windshield filler strips, glass retainers, door caps, running board binders, fender ribbons and bumpers, to-

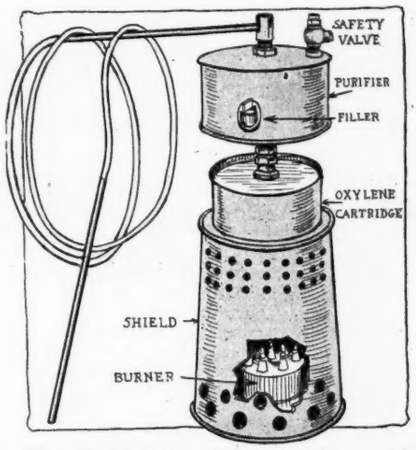

Fig. 2—Oxygen carbon-removing outfit which uses Oxylene cartridges to generate the oxygen

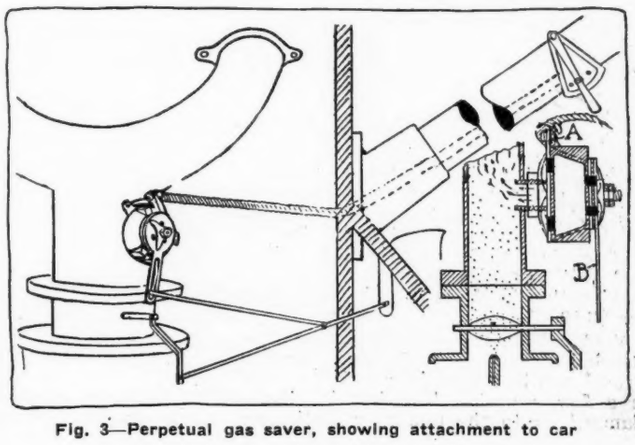

Fig. 3—Perpetual gas saver, showing attachment to car

Fig. 4—Dahlstrom metallic mouldings

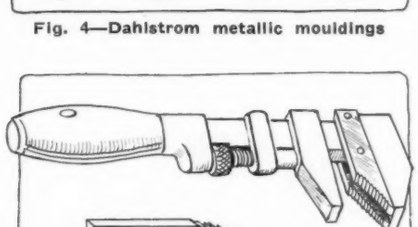

Fig. 5—Yankee wrench jaw

gether with a number of miscellaneous shapes suitable for use in the manufacture of automobiles are manufactured by the Dahlstrom Metallic Door Co., Jamestown, N. Y. A few windshield filler strips and glass retainer mouldings are shown in Fig. 4.

Although usually made of steel, most of the sections shown can be drawn from brass, bronze, copper, aluminum, or German silver, if so desired.

Straight mouldings will be cut to specified sizes or multiples thereof or furnished in random lengths.

These mouldings are furnished unfinished or with baked enamel to match any wood or color.

M-E Oxygen Generator—The rapid increase of the popularity of the oxygen process of carbon removal has resulted in the development by the Auto Gas Light Co., Hazleton, Pa., of an outfit for generating the oxygen. This is in reality an oxygen production plant on a small scale, and relieves the user of any danger in being held up through delays in receiving the oxygen gas storage tanks, also there is no rental or transportation to pay on full and empty tanks. This can be used also in oxygen and acetylene welding and a special torch is offered. This is sold by Fisher-Richards & Carr, Hazleton, Pa.

Positive Vulcanizers—Patents have just been granted to the Positive Supply Co., Davenport, Ia., on its positive portable steam tire vulcanizer. This is made expressly for use in private garages and small repair shops and for road side repairs. The entire outfit weighs but 4 pounds, so it can be carried in the tool kit of the car.

The vulcanizer consists of a metal body with a compartment for water and a compartment for fuel. The water compartment is between the flame and the tire, where it equalizes the heat generated and prevents burning the tire. It will repair both inner tubes and casings and will vulcanize casings without removing the tire from the wheel. It sells for $3.50.

Yankee Wrench Jaw—By means of an attachable jaw, Fig. 5, and monkey wrench can be turned into a pipe wrench in a few seconds. The jaw is simply clamped on to the upper or stationary jaw of the wrench. It sells for 25 cents and is made by the Bow Mfg. Co., Elgin, Ill.

Readyhot Brazing and Soldering Torch—Just as its name implies, this torch, Fig. 6, is always ready for instantaneous use because it uses ordinary city gas or acetylene for fuel.

It is designed to be used without pressure and can be adjusted while in use to give any desired heat. It is light and handy and should prove valuable to the garage and repair shop.

It is manufactured by the Nemo Chemical & Specialty Mfg. Co., Rector Bldg., Chicago, Ill., and sells for $5.

Lortz Ford Racing Body—To meet the demand of Ford owners for a sporting type of body the F. E. Lortz Co. has brought out the design shown in Fig. 7. It has spring cushions, is upholstered with genuine leather, is equipped with a 14-gallon tank and the toe boards are covered with linoleum. This body can be installed without difficulty by any one, as it is built on a special subframe, and therefore it is only necessary to remove the present body and put the new one in place.

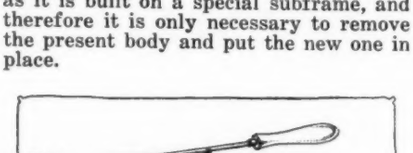

Fig. 6—Readyhot brazing and soldering torch

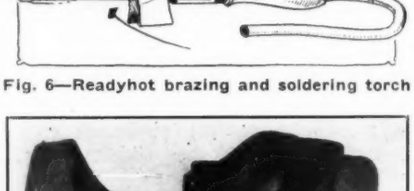

Fig. 7—Lortz Ford racing body

Duplex Cantilever Spring—A double cantilever spring, Fig. 8, for which many advantages are claimed, has recently been brought out by the Duplex Cantilever Spring Co., National Bank Bldg., Lansing, Mich.

It is claimed that with this construction a long, undulating spring of exceptional strength and easy riding qualities is obtained and that with this design the rear halves perform the function of a radius rod in a correct mechanical manner.

In using the two springs for radius rods, the thrust is distributed between them, thereby lessening the buckling tendency of the single spring. It is also stated that the Duplex stands the dip and the rebound better than a single spring. It is planned to sell this spring on a royalty basis to manufacturers.

Motor Tonic—Under the name of Moto Motor Tonic, a new liquid decarbonizer is being placed on the market by the Moto Motor Tonic Co., Wichita, Kan. The decarbonizer is fed through the air intake of the carbureter. It is stated that if it is fed to the engine about once every two weeks the rings and valves will be kept clear and carbon will be kept from forming, while if from 1 pint to 1 quart is fed three days in succession bad cases of carbonization will be cured. It retails at $3 a gallon.

Universal Water Saver—To add its quota toward the reduction of the high cost of motoring, the Utilities Equipment Co., Boston, Mass., has brought out what it calls the universal water saver. This is an automatic shut-off for water lines and this particular application in motoring is for vehicle work. The shut-off cock is so arranged that normally it is kept closed by a counterweight and only is opened when a cord is pulled, lifting the weight. The first pull of the cord opens the valve, the second closes it. This is so easily and quickly done that there is little likelihood of the attendant permitting the water to run from sheer lack of effort. The water saver sells at $7.50 in unpolished brass and $10 nickel plated.

Sturges Light Deflector—A novel device for preventing the glare of the lamps of an oncoming car from blinding the driver has been brought out by the Pacific Leather Works, Oakland, Cal., under the name of the Sturges light deflector. It consists of a bowl-shaped rubber cap about 4 inches in diameter and is applied to the windshield simply by pressing it upon the glass. It sells for $1.

Roller Bearing Universals—The Universal Machine Co., Bowling Green, O., is manufacturing standard universal joints, whose feature is that the joints are fitted with roller bearings. Each joint is a ball in the socket. The ball and socket take care of the up and down motion, the end thrust and all other strains, while the four roller bearings mounted on pins take the torque. The joint is adjustable for wear, and requires greasing only once a season, which requires five minutes' time. It is dustproof in construction and does not need a boot.

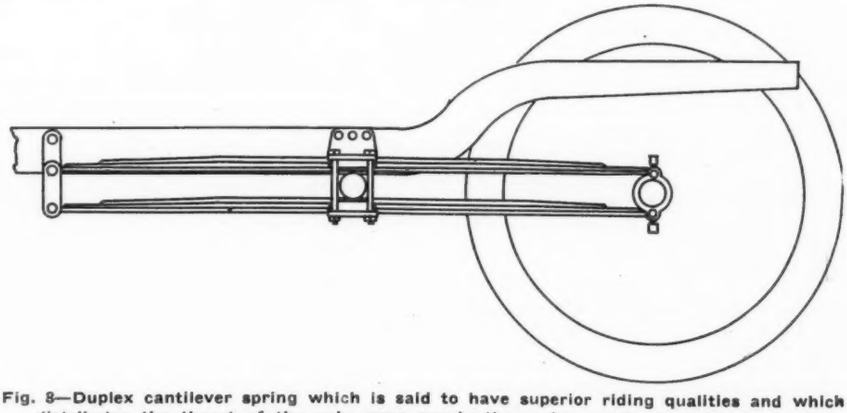

Fig. 8—Duplex cantilever spring which is said to have superior riding qualities and which distributes the thrust of the axle more evenly than when a single spring is used

JUNE 25 1914

10 Cents a Copy

The AUTOMOBILE

Engineering
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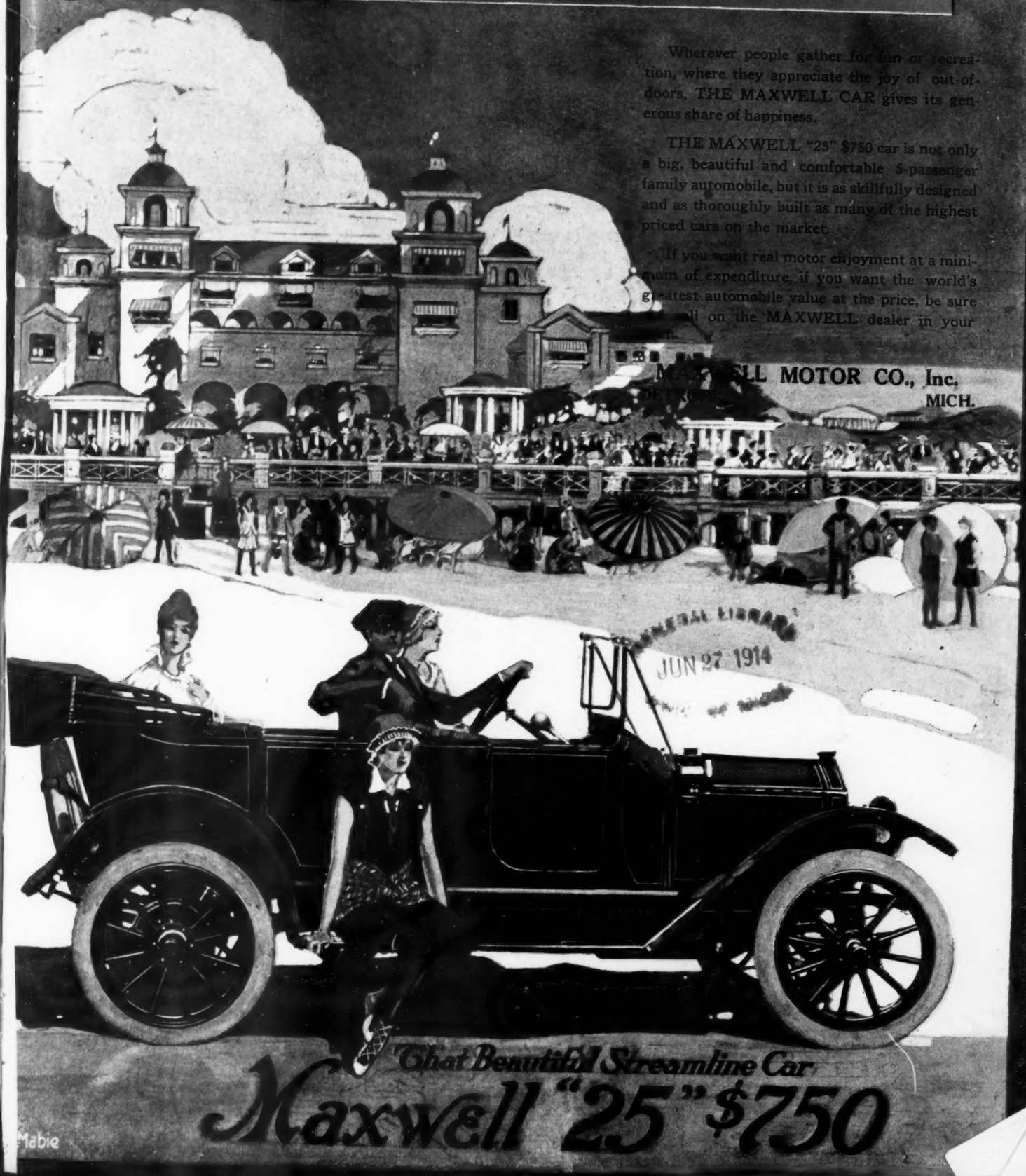

Wherever people gather for fun or recreation, where they appreciate the joy of out-of-doors, THE MAXWELL CAR gives its generous share of happiness.

THE MAXWELL "25" $750 car is not only a big, beautiful and comfortable 5-passenger family automobile, but it is as skillfully designed and as thoroughly built as many of the highest priced cars on the market.

If you want real motor enjoyment at a minimum of expenditure, if you want the world's greatest automobile value at the price, be sure to call on the MAXWELL dealer in your town.

MAXWELL MOTOR CO., Inc.
DETROIT, MICH.

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That Beautiful Streamline Car

Maxwell "25" $750

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Look For The Store With The MULTIBESTOS Cabinet

Your order will be filled in a neat, prompt and business-like way—and what is more important, you are sure of getting the best brake lining on the market.

Ask your dealer for reports of tests by the leading engineering laboratories of the country, showing conclusively that MULTIBESTOS wears 25 per cent. longer than other brake linings, at the same time possessing the maximum braking ability.

In emergencies MULTIBESTOS locks the wheels instantly; and in ordinary use it brings the car to a smooth gliding stop without the least jolt or jar.

If you would have Safety First, Last and All the Time look for the store with the MULTIBESTOS Cabinet.

"Safe in the grip of Multibestos."

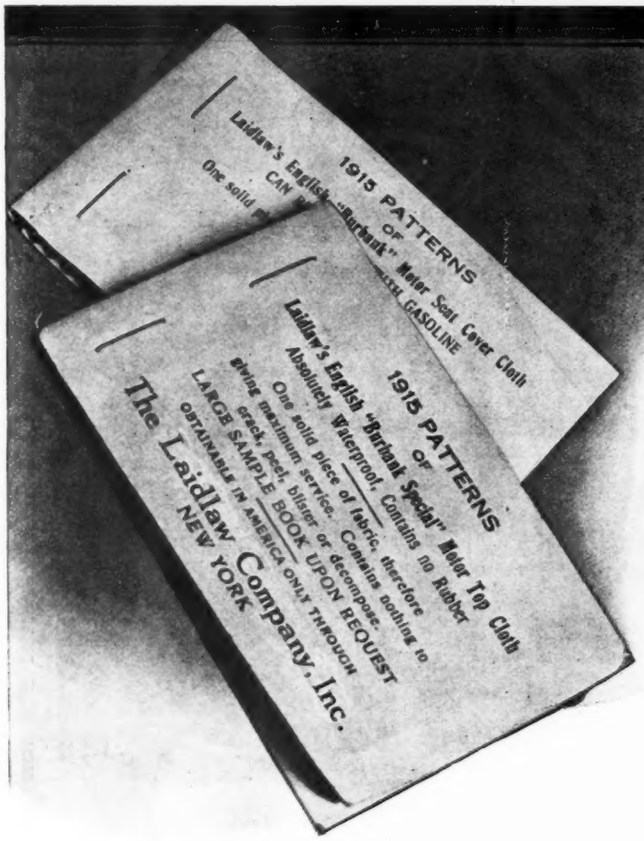
THE GRIP MULTIBESTOS BRAKE THAT GRIPS LINING

Standard Woven Fabric Co.

FRAMINGHAM, MASS.

BOSTON, 903 Boylston St.
NEW YORK, 276 Canal St.
CHICAGO, 1430 Michigan Boulevard.

PHILADELPHIA, 1427 Vine St.
SAN FRANCISCO, corner First and Howard Streets.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"Burbank" Motor Seat Cover Cloth
1915 PATTERNS
OF
Laidlaw's English "Burbank Special" Motor Top Cloth
Absolutely Waterproof, Contains no Rubber
One solid piece of fabric, therefore
giving maximum service. Contains nothing to
crack, peel, blister or decompose.
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OBTAINABLE IN AMERICA ONLY THROUGH
The Laidlaw Company, Inc.
NEW YORK

Laidlaw BURBANK MOTOR CLOTH

is the perfect top covering

BECAUSE

it is absolutely waterproof and wears indefinitely and is not injured by weather conditions. Neither extreme heat nor zero temperature affects it.

BECAUSE

it is one solid, single thickness of cloth, every shred contributing toward wear and water resistance, instead of being two thin pieces of cloth cemented together and coated over with some more or less perishable rubber or artificial leather compound.

"Burbank" is waterproof because of the way it is woven. It is not dependent for its waterproof properties upon rubber or other compounds, which, when exposed to the elements, dry out, crack, peel, blister, and decompose.

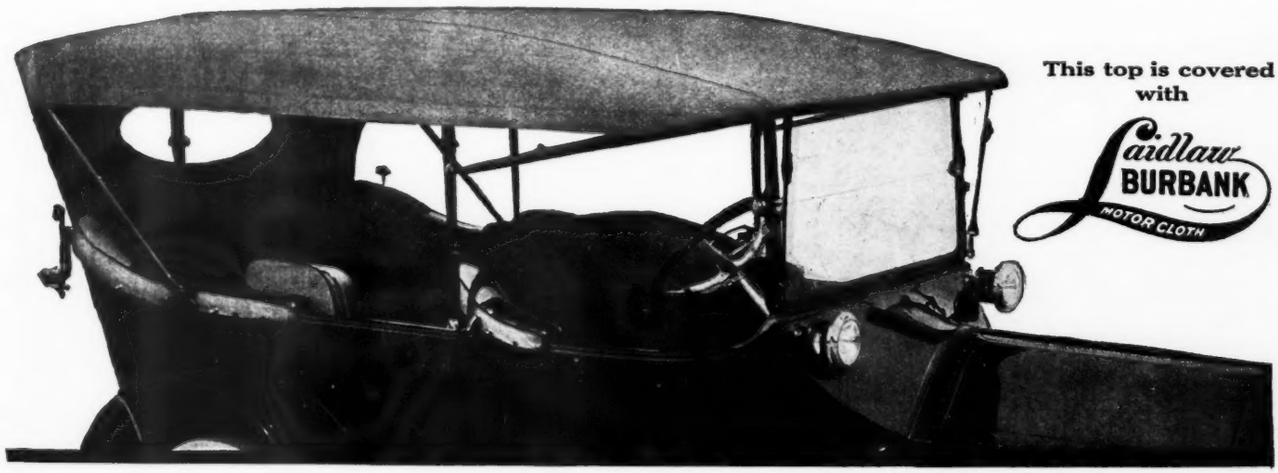
Laidlaw "Burbank" Top Cloth is guaranteed waterproof and is made in a variety of colors to harmonize with standard body paint colors.

Laidlaw BURBANK MOTOR CLOTH

is also made in a quality for automobile seat covers, to match exactly each pattern and color of "Burbank" Top covering quality.

The Laidlaw Company, Inc.

126-132 West 46th Street **New York, N. Y.**



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THE HOME OF HARTFORD AUTO COMFORT EQUIPMENT

Automobile accessories of admitted excellence which contribute to the maximum enjoyment of motoring—each a quality product and a proven factor in promoting comfort, economy and safety.

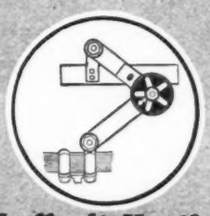
Hartford CUSHION SPRING

Hartford Cushion Springs insure the degree of flexibility which most automobile springs lack. These comfort-conserving devices *increase* flexibility and provide for easy riding on average roads just as effectively as Truffault-Hartford Shock Absorbers *control* excessive flexibility and provide easy riding on rough roads. In combination, these devices offer *super*-comfort on *all* roads under *all* conditions. Hartford Cushion Springs eliminate the continual annoyance and discomfort of travel over small ruts and bumps, car tracks, cross-walks, cobblestones, etc. They are compact and unobtrusive, of the finest material and workmanship, and easily applied to any car. Four Models, $35, $30, $25. Special Ford Type, $16.

Hartford Bumper

The strongest motor car bumper in the world—no other statement does justice to the Hartford Bumper. A veritable breastwork between car and passengers and the dangers of collision. The four-leaf friction-springs—an exclusive feature—completely absorb the shock and jar.

Saves repair bills by preventing smashed headlights, damaged radiators, twisted mud guards, broken springs, etc. Beautifies the smartest car. Made of staunch metal tubing reinforced with a solidified cement-like composition, combining maximum strength with minimum weight. Attached to any car in 15 minutes. Four sizes—$15, $12.50 and $10. Special Ford Type, $10.



Truffault-Hartford SHOCK ABSORBER

The Truffault-Hartford Shock Absorber is the inevitable choice of motorists who give the three-fold problem of greater comfort, safety and economy, the study it deserves. For ten years this *standard* device has "made good" by making "Every Road a Boulevard." Today a quarter-million motorists enjoy constant comfort through its use. Twenty-five leading makers recognize Truffault-Hartford as "The Pioneer *and the Best*" by adopting it. Inventive ingenuity earned for the Truffault-Hartford the exclusive right to use the principle of Rotary Friction. Science and results prove that this is the only principle that actually absorbs shocks and vibration. Absolute comfort, lowered upkeep cost and greater safety are logical results. Prices—Five Models—$60, $50, $35, $16. Special Ford Type, $16.

Hartford Auto-Jack

A bright spot in many a wayside stop for repairs is the easy, rapid, efficient work of the Hartford Auto Jack. This handsome tool lifts a heavy car with wonderful ease and quickness. No muscle needed, no back-breaking, perspiring labor—just a simple wrist-movement and up goes the car; a turn of the reversing lever and down it comes smoothly, without jerk. It's all in the gears, ingeniously devised to multiply energy. Made for the motorist willing to pay a little more for something *very* much better.

Price, $6.50.

Guarantee: "Money back if not satisfactory." Under this broad policy all Hartford products are sold. Any article of our manufacture not proving satisfactory after 30 days' trial from date of purchase, can be returned and the purchase price will be refunded.

HARTFORD SUSPENSION CO. E. V. HARTFORD, Pres.
Main Office and Works: 144 Bay St., Jersey City, N. J.

Manufacturers of Hartford Electric Starting and Lighting System

Branches and distributors in all principal cities of United States and Canada — Dealers everywhere

The Automobile
THE CLASS JOURNAL COMPANY
231–241 W. 39th STREET NEW YORK CITY

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The Automobile is subscribed to by nearly 20,000 motor-wise enthusiasts—real enthusiasts—whose knowledge of cars, parts and accessories is recognized and respected—men who can tell you "what's under the bonnet, and why." This clientele is the vital "purchasing and purchase directing power." Are you in that class? You should be. Read The Automobile every week. Yearly subscription, three dollars. The best three dollar investment you could possibly make, to insure "up-to-the-minuteness" in all things pertaining to the sport and the industry. Send your subscription today. Every motor-wise man should belong to our subscriber family.

The One Shock Absorber that positively

ABSORBS SHOCKS
MINIMIZES REBOUNDS
PREVENTS SIDESWAY

The Eclipse Shock Absorber

The reason that the ECLIPSE Shock Absorber for Ford cars is the one shock absorber on the market that absorbs shocks, minimizes rebounds and prevents side-sway all at the same time, lies in the basic principle upon which the ECLIPSE Shock Absorber is constructed. In other words, the very fact that ECLIPSE Shock Absorbers are different from any other shock absorber on the market should be the impelling motive which would lead you to equip your car with ECLIPSE Shock Absorbers.

Price for full set, both front and rear

$10.00

We have had a great number of ECLIPSE Shock Absorbers under close observation right in our local field for some time, and we have yet to find one person who is not enthusiastic over their performance. For this reason, we have no hesitancy in guaranteeing satisfaction absolutely. At any time within thirty days you are at perfect liberty to return your set of ECLIPSE Shock Absorbers if they do not live up fully to your ideas of what they should do, as represented by us. The fact that ECLIPSE Shock Absorbers are low in price—selling for $10.00 for a full set of both front and rear, means only that being simple both in design and manufacture we are able to offer them to Ford car users at a low price. They admit of easy installation on any Ford car by anybody who knows the simple process of using a monkey wrench. Your dealer can probably furnish you with ECLIPSE Shock Absorbers, but if he cannot, write direct to us and we will put you in touch with somebody who can.

DEALERS—These shock absorbers are fully guaranteed just as have our other products been guaranteed in the past. Our advertising campaign is increasing the demand for these shock absorbers constantly, and we will be glad to enter into selling arrangements with you. Write to us immediately for our proposition.

THE BROWN COMPANY

210 BELLEVUE AVE., SYRACUSE, N. Y.

BROWN JR. TIRE PUMP

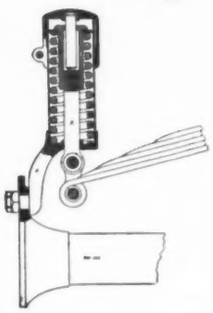
$7.00

For Fords and other Small Cars

This little pump is made of grey iron bored and reamed. Can't get out of order. Won't overheat and stick in the cylinder. Always works. Pumps pure cool air. Saves your time, temper and tires. Wears forever. Nothing like it at anywhere near the price. Find out all about it. Your dealer or your neighbor knows; if not, ask us.

Protects you from injury
Saves car and tires
Yet costs you nothing

For the Rear

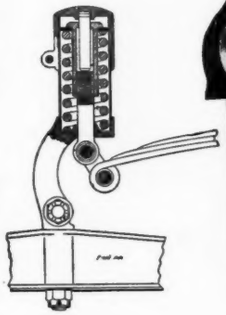


Cox Safety Axle and Radius Rod Support

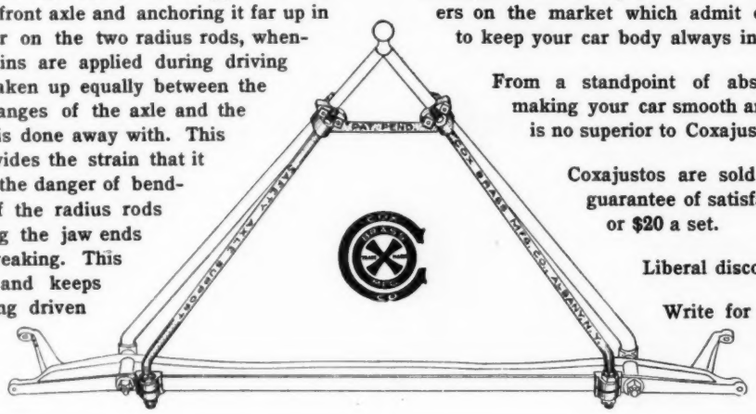
To give our customers the full measure of comfort and efficiency to which they are entitled from the use of Coxajusto Shock Absorbers for Ford cars, we have just placed upon the market (free of cost to purchasers of a set of Coxajusto Shock Absorbers) the Cox Safety Axle and Radius Rod Support. This is an absolute Ford necessity on every Ford and alone sells for $5. But because of the fact that it adds to the efficiency of the car itself and consequently improves the performance of the shock absorbers, we are supplying this safety feature without extra charge to purchasers of Coxajusto Shock Absorbers.

Note the pencil drawing below of the front axle showing the triangular radius rod. In Ford construction, the application of road and driving strains has a tendency to twist and bend the axle toward the back of the car. This is true because the radius rod instead of being supported in the centre of the axle is supported from the top of the front axle, thus offering great leverage for the magnifying of the initial strains and stresses due to road inequalities and rapid driving.

For the Front



By applying this axle and radius rod support to the lower flange of the front axle and anchoring it far up in wedge-shape manner on the two radius rods, whenever stress and strains are applied during driving such strains are taken up equally between the upper and lower flanges of the axle and the dangerous leverage is done away with. This added support so divides the strain that it prevents absolutely the danger of bending and breaking of the radius rods as well as protecting the jaw ends of the axle from breaking. This prevents accidents and keeps your tires from being driven out of alignment.



Remember that Coxajustos are the only shock absorbers on the market which admit of easy adjustments to keep your car body always in proper balance.

From a standpoint of absorbing shocks and making your car smooth and easy riding, there is no superior to Coxajustos on the market.

Coxajustos are sold under an absolute guarantee of satisfaction for $10 a pair or $20 a set.

Liberal discount to the trade.

Write for our co-operative advertising and selling plan.

A Ford "necessity"—Cox Safety Axle and Radius Rod Support. Given free to purchasers of a set of Coxajusto Shock Absorbers.

Cox Brass Mfg. Co., Dept. F, Albany, N. Y.

1777 Broadway - New York City
870 Woodward Ave. Detroit, Mich.
1216 Van Ness Ave. San Francisco, Cal.
899 Boylston St. - Boston, Mass.
2637 Michigan Ave. - Chicago, Ill.

If your dealer will not supply you with Coxajustos and this Support free, write direct to us.

Pat. applied for.

ELECTRIC LIGHT BULB CASE

ONE OF THE MANY GOOD THINGS IN THE LINE OF

DOVER AUTO SPECIALTIES

is the

New Dover Electric Light Bulb Case

It will carry extra bulbs safer than the ones in the lamps of the car. Made of extra heavy seamless steel—all other parts Electric Welded. No rivets or solder used in the construction.

The bulbs are securely held in place by a new brass spring locking device, which gives absolute protection against rough handling and vibration.

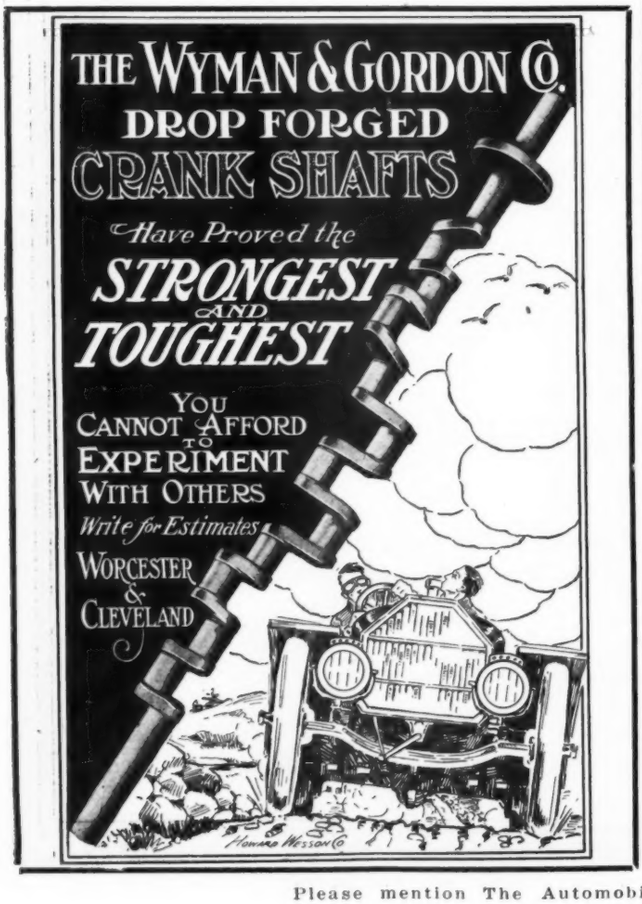
A new bulb always ready in perfect condition when needed.

Do not confuse our heavy seamless steel case with the cheap pasteboard or wood boxes, which are quickly ruined by moisture or rough handling and are only fit for keeping bulbs on the shelf in a store.

Send for New Catalog of over 235 Dover Auto Specialties.

DOVER STAMPING & MFG. COMPANY

CAMBRIDGE, MASS.



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PROTECT YOUR INVESTMENT in spare tires and tubes

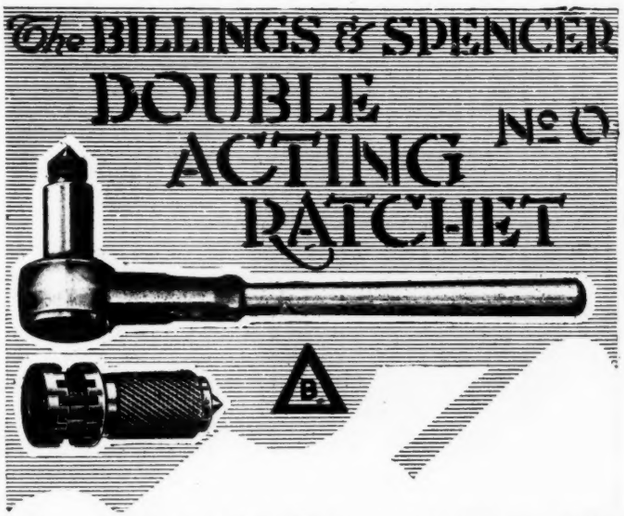
You are never without extra tires and tubes, an investment you cannot realize any benefit from until they are called into service in an emergency, but will they be in usable condition when the emergency comes up?

GILBERT TIRE CASES afford perfect protection to spare tires and keep them and prevent their deterioration. They save their cost in the way they preserve your extra tires.

Write for our 1914 catalogue. It is the best guide to economy ever printed.

THE GILBERT MFG. COMPANY
New Haven, Conn.

The BILLINGS & SPENCER DOUBLE ACTING RATCHET No. 0



The Most Useful and Durable Garage Tool

This double acting ratchet drill is as carefully made as the highest grade machine tool. It is right in design, right in workmanship and right in material.

These wrenches are made in all designs and patterns suitable for your particular needs, and can be had from most good dealers or from us.

Get our booklet concerning them

BILLINGS AND SPENCER COMPANY
HARTFORD CONN

Pat. applied for.

ELECTRIC LIGHT BULB CASE

ONE OF THE MANY GOOD THINGS IN THE LINE OF

DOVER AUTO SPECIALTIES

is the

New Dover Electric Light Bulb Case

It will carry extra bulbs safer than the ones in the lamps of the car. Made of extra heavy seamless steel—all other parts Electric Welded. No rivets or solder used in the construction.

The bulbs are securely held in place by a new brass spring locking device, which gives absolute protection against rough handling and vibration.

A new bulb always ready in perfect condition when needed.

Do not confuse our heavy seamless steel case with the cheap pasteboard or wood boxes, which are quickly ruined by moisture or rough handling and are only fit for keeping bulbs on the shelf in a store.

Send for New Catalog of over 235 Dover Auto Specialties.

DOVER STAMPING & MFG. COMPANY

CAMBRIDGE, MASS.

THE WYMAN & GORDON CO.

DROP FORGED CRANK SHAFTS

Have Proved the STRONGEST AND TOUGHEST

YOU CANNOT AFFORD TO EXPERIMENT WITH OTHERS

Write for Estimates

WORCESTER & CLEVELAND

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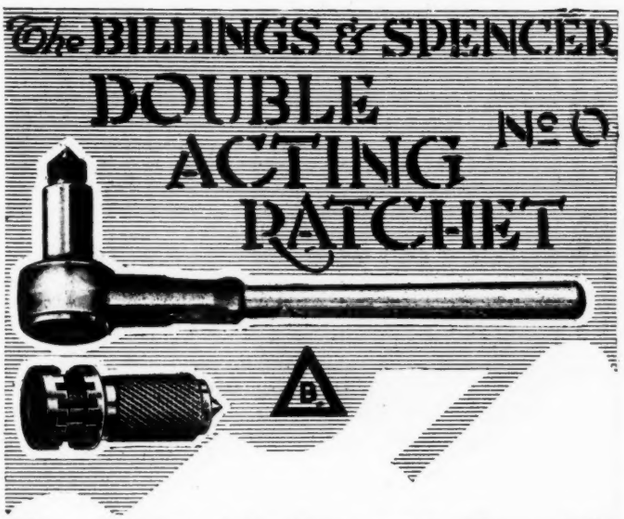
You are never without extra tires and tubes, an investment you cannot realize any benefit from until they are called into service in an emergency, but will they be in usable condition when the emergency comes up?

GILBERT TIRE CASES afford perfect protection to spare tires and keep them and prevent their deterioration. They save their cost in the way they preserve your extra tires.

Write for our 1914 catalogue. It is the best guide to economy ever printed.

THE GILBERT MFG. COMPANY
New Haven, Conn.

The BILLINGS & SPENCER DOUBLE ACTING RATCHET No. 0



The Most Useful and Durable Garage Tool

This double acting ratchet drill is as carefully made as the highest grade machine tool. It is right in design, right in workmanship and right in material.

These wrenches are made in all designs and patterns suitable for your particular needs, and can be had from most good dealers or from us.

Get our booklet concerning them

BILLINGS AND SPENCER COMPANY
HARTFORD CONN

Classified Advertising

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FOR SALE—NATIONAL ROADSTER fully equipped, practically new. A. F. Schrup, Dubuque, Iowa.

KNIGHT - STODDARD - DAYTON 1913, 7-passenger, six-cylinder, large, imported Daimler Silent-Knight engine; driven 4000 miles only; six new tires and tubes; Gray Davis electric starter and lighting; motor-driven Kellogg tire pump; seat covers; top; speedometer and full equipment. Car is in fine condition. Insured $5300. No further use for large car. Make me an offer. Fred. C. Arner, Buffalo, N. Y.

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WANTED—A THOMAS SURREY (TORpedo) Body, 1912 style, upholstered, second hand, cheap. Give description. Lock P. O. Box 822, Greenport, L. I., N. Y. 19

WANTED TO EXCHANGE — 20 ACRES very rich land, and one town business lot, 25 x 150, at Lakeview, Oregon, for a new automobile. Standard make. P. O. Box 909 Canton, N. C. 22

Situations Wanted

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1—8 Cylinder Renik Aeroplane Engine, cost $2500.00; has never been unpacked.

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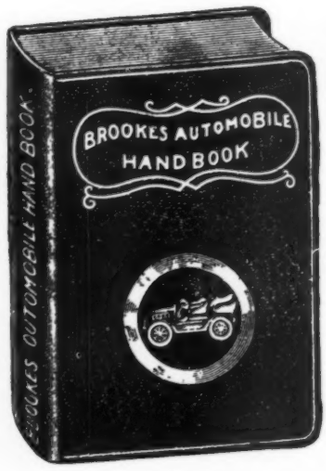
St. Johnsbury, Vt.



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of the Automobile Industry

For Second-Hand Cars, Surplus Parts, Accessories, Tires Machinery & all other Special Announcements of a Similar Character

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AUTOMOBILES
Used Autos, Latest Models
Bargains in leading makes. Advise model desired.
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R. C. H. Touring, 1913 Model..... 400
R. C. H. Roadster, 110" Wheel Base..... 400
Every one of these cars is in absolutely first-class shape in every respect.

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If you are in the market for a 1912 or 1911 car that is as good as new at a price of
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overhauled and repainted, demountable rims, up to date in every respect
Condon
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Westchester Accessories Co.
1777 Broadway, New York City

Bargains IN Auto Supplies

We are justly proud of the fact that our special Ford section contains the most complete line of meritorious accessories ever offered to the Ford owner.

Ford Lighting Outfit, with tungsten bulbs	$2.24
Ford Magneto Horn	2.60
Ford Foot Accelerator	1.38
Ford Water Circulator	7.79
Ford Lead Proof Piston Rings	1.40
Ford Regular Piston Rings	.14
Ford Leather Fan Belts	.20
Ford Fabric Fan Belt	.20
Ford Clutch Release	.55
Ford Joint Boots, per set	.61
Ford Brake Lining Sets	.60
Ford Cylinder Reamer	1.47
Ford Valve Refacer	1.47
Ford Grease Cups, T Handle	.10
Ford Oil Cups	.06
Ford Stewart Speedometer	10.25
Ford Gasoline Tank Gauge	1.47
Ford Master Vibrator	5.99
Ford Slip Seat Cover and Top Hoods, Touring	10.50
Ford Slip Seat Cover and Top Hoods, Runabout	7.95
Ford Rubber Mats	.88
Ford Rear End Tire Holders	1.93
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We prepay transportation charges on all orders amounting to $10.00 or over (excluding tires) within a radius of 500 miles from New York City.

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PROMPT AND EFFICIENT SERVICE is one of our strongest assets and is the subject of envy to our competitors.

We do not use leaders in an effort to mislead the motorist. All our goods are sold as low as possible consistent with the high quality of our accessories.

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30x3 Tire, guaranteed for 5,000 miles, plain tread	9.52
30x3½ Tire, guaranteed for 5,000 miles, plain tread	12.78
30x3 Tire, guaranteed for 5,000 miles, non-skid	11.15
30x3½ Tire, guaranteed for 5,000 miles, non-skid	15.05
30x3 Tire, unguaranteed plain tread	7.73
30x3½ Tire, unguaranteed plain tread	9.60
30x3½ Gray Tubes, guaranteed	2.80
30x3½ Red Tubes, guaranteed	3.34
30x3½ Medium Reliners	1.52
30x3½ Extra Heavy Reliners	3.00
Shaler Gasoline Vulcanizer	2.48
Adamson Universal Vulcanizer	2.21
Marvel Steam Vulcanizer	2.48
Three-Cylinder Hand Pump	2.65
Brown Impulse Tire Pump	10.75
Mayo Spark Plug Pump	8.50
Schrader Gauge	.75
Running Board Tire Holders	1.45
Sootless Spark Plugs, any size	.85
Bethlehem Spark Plugs, any size	.60
Red Head Spark Plugs, any size	.50
Rajah Spark Plugs, any size	.80
All-in-One Spark Plugs, any size	.85
Tool Boxes, 14 inch	1.51
Tool Boxes, 18 inch	1.81
Tool Boxes, 20 inch	2.00
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Tool Boxes, 24 inch	2.47
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Little Steersman	2.65

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motor car parts and service.
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For Ford ignition sets at a low price, neatly made and of good material, write
J. M. White
5141 Parrish St., Phila., Pa

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Michigan, Mora and Dragon Parts in Stock

We maintain a complete stock of parts for the above cars

PRICE LIST ON APPLICATION

65 LAUREL STREET
PHILADELPHIA, PA.

AXLES

Rear Axles with 3 speed transmission, complete with hubs, hub caps, bearings, 36x4½ wheels with demountable rims, torsion tube, drive shaft, universal joint, complete $150.00
Lewis Axles front and rear with torque rod, $85.00.

AUTOMOBILE APPLIANCE CO.
1436-38 Michigan Ave., Chicago, Ill.

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We guarantee them as
GOOD AS NEW
All sizes and makes in stock Ready for immediate delivery
At Prices that will Interest you
AHLBERG BEARING CO.
2636 Michigan Ave., Chicago. 1790 Broadway, New York. 805 Woodward Ave., Detroit. 93 Massachusetts Ave., Boston.

Buick Model 17 Radiators	$30.00
Staver Radiators, various models	30.00
Flechter 1¼" Carburetors	9.50
Steering Gears for American Cars	25.00
Brake Equalizer Sets, American	5.50
Universal Joints, each	3.75
Lewis front and rear axles, set	90.00

Other bargains.

AUTOMOBILE APPLIANCE CO.
1436-38 Michigan Ave., Chicago, Ill.

"BUILD A ROADSTER"

FRAMES $6.00, Axles $45 Set. Wheels 32x3 $9.00 set.
Springs $9.00 set. Round Gasoline Tanks $3.00.
Open Roadster Bodies not upholstered $10.
Fore Door Roadster Bodies upholstered $35.
These parts are all New and Fit each other.
THOUSANDS OF OTHER AUTO PARTS AT BARGAIN PRICES—LET US KNOW YOUR NEEDS.
DEQUINDRE AUTO REPAIR CO.,
474 Larned St. E, Detroit, Mich.

BUILD YOUR CAR

Complete Chassis in Parts, $400.00
Get our Circular.
AUTO PARTS CO.
737-739 Jackson Blvd., Chicago

The Clearing House — continued

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ball and roller—of all makes. We also repair or exchange ball bearings.
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Branch: 1314 Arch St., Phila., Pa.

Copper and Galvanized Tanks

Manufactured and Repaired.
Radiators, Lamps, Mud Guards, Mufflers.
Aluminum Soldering.

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Reg. $100.00 "APLCO" lighting outfits including dynamo, battery, regulator and cut-out, and Pilot Lamp. Our special price $37.50. Can be attached to any car. Also a few Gray & Davis, Vesta, etc. Write for special prices. Job lots of all kinds of auto accessories always on hand at giving away price.

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Disc Clutch Oil

Long and exhaustive tests conducted by many leading disc clutch makers have definitely proved that disc clutch oil is superior to any mixture tried.
Nine-tenths of clutch trouble is due to the improper mixture either too light or too heavy.
Send one dollar for a trial can and prove it for yourself. Agents wanted.
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Honeycomb	$28.00
Tubular	22.00

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Fix Up Your Automobile With Boyer's
Air Drying, Glossy Refinisher and Color Finishes—all colors. Write us condition of your car.
BOYER LABORATORY COMPANY,
5 West Michigan St., Chicago.

Ford Automobile Specialties.

Look for the APCO on the box. If you see this trade mark, you are safe in every way, for it means "Every sale a sale of satisfaction." Your money will be cheerfully refunded if you are at all dissatisfied. The APCO goods cost you no more, so insist and don't let your dealer sell you "something just as good" and on which all sales are final. He makes more money, but where do you get off? Remember if your dealer won't refund your money, we will. You buy APCO and let the other fellow get the imitation. Sold the world over.

AUTO PARTS CO., PROVIDENCE, R. I.

The originators and largest manufacturers of Ford specialties in the world.

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1914 Models—Five-passenger, fully upholstered; fit most any car. Cost. $350.00; our price, while they last, $85.00. Write for full description.

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Fore Doors For All Old Models
Prices Right
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Write for our catalog showing our complete line.

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You will save trouble and money by installing our time elevating device.
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This radiator will properly cool any Ford motor and make your Ford a better car.
Get our dealers' proposition
Price $25.00 F.O.B. Detroit

Detroit Radiator & Specialty Co.
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We can make your car the easiest rider made with light or heavy load; no jolts, no jars, no upthrow. Write us.
Automobile Machine Company
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Equip your cars with Seat Covers. Our direct to car-owner plan will save you money. Ten thousand satisfied customers last year.

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Dept. A, Racine, Wis.

FORD RADIATORS
Model T Honeycomb.....$22.50
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1436-38 Michigan Avenue., Chicago, Ill.

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25 Lincoln milling machines, $25.00 to $100.00 each.
LUCAS & SON,
Bridgeport, Conn.

FOR SALE AT A BARGAIN
New 5 x 6 four-cylinder, governor-controlled engine, fully equipped with carburetor magneto. Will sell for much less than cost.
Fred Hanson
570 Prior Ave. St. Paul, Minn.

FOR SALE
A 12 barrel Gasoline Storage Tank and Wayne long distance self measuring pump with filter. Also cabinet enclosing pump—curb delivery with pedestal and globe light. All in first class condition. Address **S. C., Box P 722,** care Automobile.

FULL PANEL
Commercial Delivery Bodies
For Ford Cars Exclusively
Price $68.00
FORD COMMERCIAL BODY CO.
1790 Broadway, New York
Send for Catalog B.

GUARANTEED RADIATORS
Not always necessary to buy new radiators. New cores can be furnished for frozen or damaged radiators.
We build the fin and tube type. Guaranteed copper fins and tube.

Ford Model T core	$14.00
Ford R. S. & M.	23.00
Hupmobile 20	23.00
Hupmobile 32	30.00
Warren 30	25.00
Warren 40	30.00
E. M. F., Patterson, Cole 30	30.00
Flanders 20, Paige 1912	25.00
Buick 10, 14, 32 and 33	25.00
Buick 16, 17, 18, 19, 21, 26, 27	30.00
Hudson 20	25.00
Hudson 33, Cadillac 30	30.00
Paige 1910, 1911	23.00

The above is the price of cores only. Where casings are damaged beyond repair, add $5.
All our work guaranteed absolutely new—built to your order.
Do not be misled; cores cannot be rebuilt. Write for price on radiators not mentioned in above list.

HURON RADIATOR & LAMP CO.,
253-255 Jefferson Ave.,
Detroit, Michigan
Terms cash with the order.

FOR SALE
38 American Ball Bearing Axles, front and rear, large size and frames 13' 6" built for same. Will sell lot or singly. No reasonable offer refused.
Crescent Motor Car Company
First and St. George Streets St. Louis, Mo.

Get that beautiful nickelplated finish on your auto trimmings. Let QUICK-KNICK plate them. Plates in one minute. Lasts indefinitely. Guaranteed preparation. Samples and particulars upon request.
Forest City Sales Co., "N" Fremont, Nebr.

Have An Expert Buy

and inspect for you.
Machinery, Tools, Hardware,
and Garage Equipment.

Mechanical or Electrical

H. JONSON
OWNERS' AGENT
207 Dyckman St.
New York

HERRESHOFF MOTOR CAR "OWNERS"

This company has been reorganized under new management and with capital. We are moving our plant to Indianapolis, Indiana. Our policy will be to furnish prompt, first-class service for all repair parts to Herreshoff cars. For immediate attention to orders for repair parts write direct to our new factory, South Meridian Street and Belt Ry., Indianapolis, Indiana.

Herreshoff Motor Co.

S. Meridian St. and Belt Ry.
INDIANAPOLIS, IND.

I WILL SELL YOU CLINCHER
or straight side tires, either firsts or seconds, cheaper than any one in the United States.
D. Ogden, Columbus, Ind.

NEW FOREDOOR BODIES, $50
Upholstered. Tops, $10. Top Covers, $1. Steerg. Col., Axles, Frames, Accessories.
20th Century Company
1692 Broadway, near 53rd. New York City

The Clearing House — continued

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Complete Marquette Auto Plant

Extraordinary Price Inducements

I have been authorized to dispose of the entire lot of automobile parts, supplies, accessories, tools, bodies and everything for the automobile, including parts to build a complete car. This is the biggest lot of parts ever offered at direct sale.

Spark Plugs	$.19
End Wrenches	.15
Magneto Boots	.50
Dash Air Pumps	.79
Starting Crank Boots	.30
Gasoline Strainers	.50
Tail Lamps Oil	1.50
Tail Lamps Electric	1.75
Side Lamps Oil	1.50
Side Lamps Combination	1.75
Gas Head Lamps per pair	6.25
Electric Head Lamps pair	7.50
Pressed Steel Frames	5.00
Steering Gears "Gemmer"	12.19
Steering Gears "Jacox"	8.19
Weston Mott Rear Axles	40.00
Sliding Gear Transmissions	45.00
4 Speed sliding gear transmissions with multiple disc clutch	50.00
Fore door roadster bodies—in rough	20.00
Fore door roadster bodies—painted and upholstered	55.00
Touring car bodies—painted and upholstered	65.00
Model H High Tension K. W. Magnetos	18.50
Hartford Shock absorbers—Set	20.00
E. Z. Rider Shock Absorbers for Ford Roadster and Touring Cars—Set	15.00
40 H. P. Motors	125.00
Exide Batteries	5.50
Wheels all sizes	3.00
Front Axles	10.00
Electric Horns	2.49
Carburetors—Rayfield-Schebler, Kingston & Fletcher	5.19
Windshields	9.00
Stromberg Carburetors	8.19
1" Buffalo Carburetors	3.00
Oval Gasoline Tanks—11x22x29	3.00
Straight High Tension Volta Magnetos	15.00
4 Cyl. Remy Magnetos with coil	20.00
Ford Lighting Outfit	2.25
Ford Lighting Generators	25.00
Ford Wheel Pullers	.30
Rayfield Carburetors with Manifold for Ford Model "T"	8.20
Ford Oil Gauges	.30
Ford Spark Plugs	.19
4 Cyl. Remy Coils	6.00
Splitdorf Coils	6.00
Standard Speedometers for 36x4 wheels	7.00
Stewart Speedometer Heads	3.95
Tool Boxes—18x8x9	1.25
Tool Boxes—24x9x8½	1.50
Electric Side Lamps—for cycle cars	1.00
Brake Lining per foot	.25
Tire Repair Kits	.35
Front and Rear License Brackets	.35
Steering Wheels	1.00
Tire Covers—any sizes	.75
⅜ and ⅝ Brake Rods with clevis	.35
Mufflers 1¾ opening	1.50
Foster Shock Absorbers set	6.00
Rear Axles with unit transmissions	80.00
Assorted spring clips per doz	1.00
100 Assorted Cap Screws	.50
100 Assorted Nuts	.50
100 Assorted Rivets	.20
100 Assorted Washers	.35
Erie Pipe Wrenches	.25
Watch dog locking devices	.75
Warner Autometers—complete	9.50
Rumble Seats	3.50
Tool Boxes	1.25
Robe and Foot Rests	.35
Auto Jacks	1.00
Tire Pumps	1.50
Metal Polish—½ and 1 gal. cans, per gallon	.50
Auto Soap 5 and 10 lb. cans per pound	.10
Tool Kits	1.09
Tire Chains many sizes for	3.09
Bulb Horns—complete	.75
Vulcanizers	.79
Stewart Gas Savers	3.50
Radiators for many cars	20.00
Springs—many sizes	3.00

Almost Everything At a Special Low Price—Send for Big Catalogs

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Liquidator
409 Lafayette Boulevard
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This is my fifty-third sale. I have closed out that many factories.

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BARGAINS?

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Prices 30-50%

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31x4	10.70	3.40
32x4	11.10	3.55
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34x4	12.75	3.85
35x4	13.40	4.05
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31x4	14.50	3.60
32x4	15.00	3.75
33x4	15.75	3.90
34x4	16.50	4.00
35x4	16.75	4.10
36x4	17.00	4.25
32x4½	19.25	4.50
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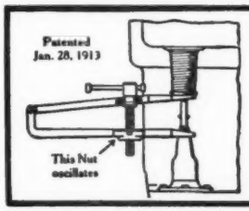

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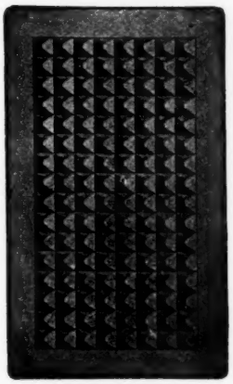

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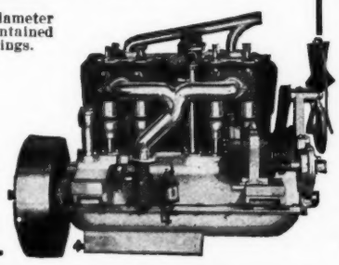

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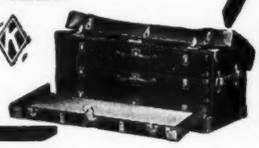

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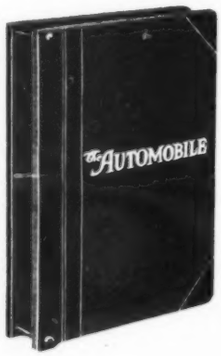

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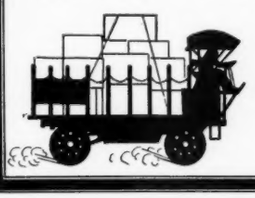

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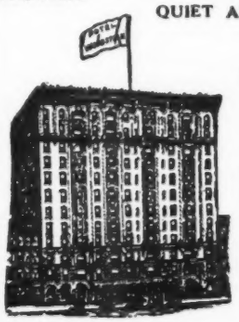

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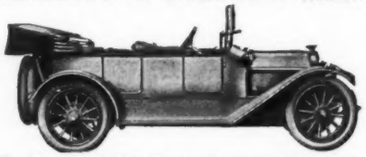

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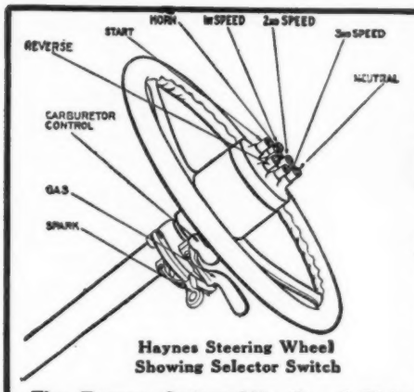

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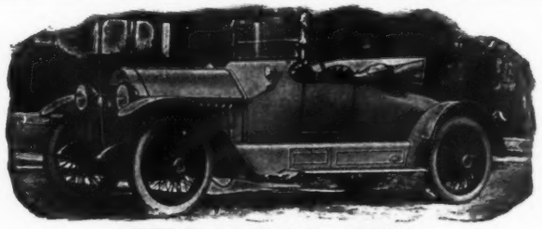

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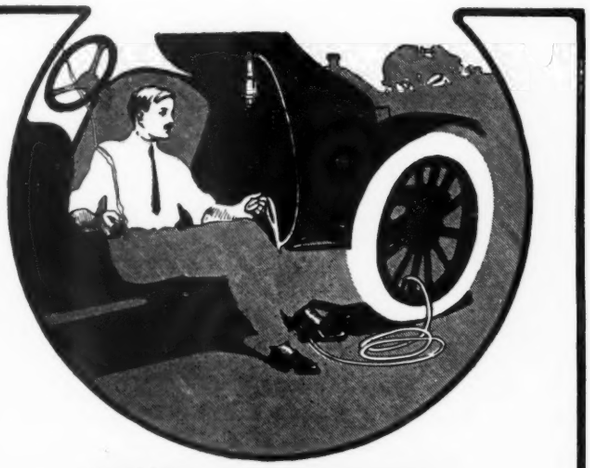

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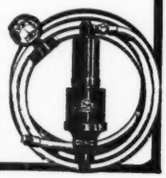

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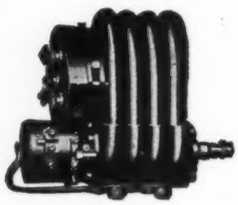

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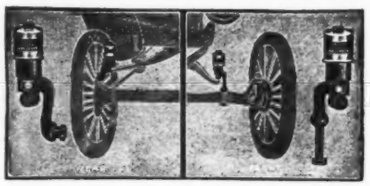

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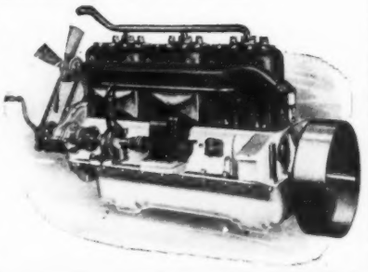

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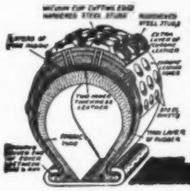

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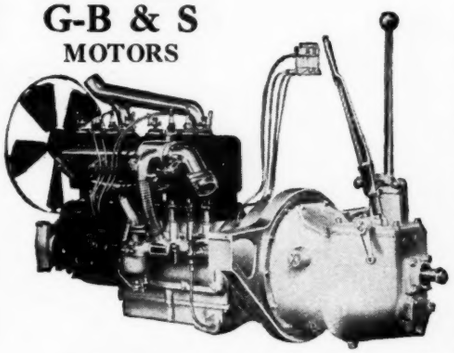

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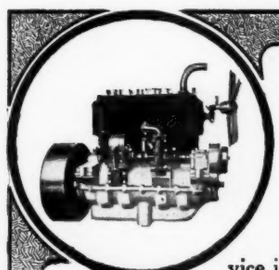

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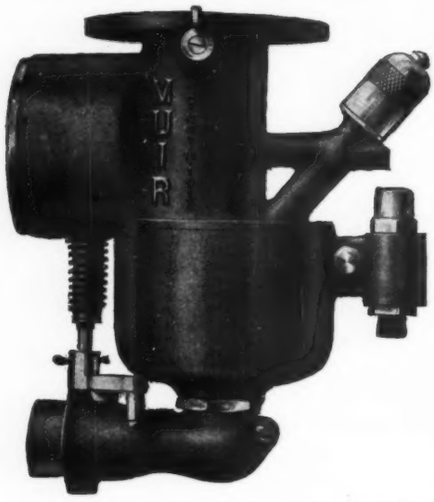
CONTINENTAL MOTORS — Power that Runs the Nation — AMERICA'S STANDARD



You don't expect EVERY suit of clothes to fit you.
You wouldn't expect EVERY carburetor to fit your motor.

MUIR

The "Made-To-Order" CARBURETOR

is scientifically and exactly "cut to fit" your motor. This is not a figure of speech, it is an actual fact. Every make and model of motor before we supply a carburetor for it, is carefully tested on our dynamometer block at every speed and under every load. The highest efficiency proportion of gas and air is carefully noted and plotted; and then this curve is cut into the cam, which is placed in the carburetor. Thereafter, absolutely the same high efficiency mixture is perpetually maintained automatically.

For ten years engineers have battled with the problem of gasolene motors' peculiarities and yet although they are as diverse in characteristics and shape as human beings, we have expected one suit to fit them all.

THE MUIR CARBURETOR is the simplest, most scientific and thoroughly successful carburetor yet placed on the market. It is in no sense one more of the great mass of mixing valves and spring regulated combinations which have flooded the market for some years. THE MUIR CARBURETOR is a laboratory made product and the cam which measures or meters out the exact ratio of gas or air which gives the highest efficiency at every speed for a particular motor, has been plotted on the dynamometer block and cut from the hardest chrome nickel especially to fit the motor.

These are some of the reasons why you should get our literature and become familiar with the only carburetor that will give scientifically perfect results.

MUIR COMPANY, Inc., - - - - Detroit, Mich., Dime Bank Bldg.
Baltimore, Md., Equitable Bldg.

New Departure Ball Bearings

A Fair Question Deserves a Fair Reply

In designing your next car, the question of bearing equipment will, of course, receive the serious consideration so important a question deserves.

In all fairness, New Departure ball bearings more than answer that question.

It is a bearing of guaranteed quality, including high grade materials, accuracy of finish and uniformity of dimension. It is the product of an American factory with ample capacity for prompt and complete deliveries without liability of troublesome delays such as are sometimes experienced by manufacturers who buy their bearings abroad.

Why not give New Departures a thorough tryout?

A line from you will bring our literature and representative. May we send either or both, and inform you fully of our proposition?

THE NEW DEPARTURE MANUFACTURING COMPANY, Bristol, Conn.

WESTERN BRANCH: 1016-17 Ford Bldg., Detroit, Mich.

Racing is the Real Test of Spark Plugs

The terrific heat, the blistering, boiling mass of carbon and oil, the white hot gases that surround it for hours, put a spark plug thru a test absolutely unequalled in touring.

You can depend for any service upon a plug that consistently goes thru the test of racing.

There is only one plug that you can buy of your dealer that will do it—it's a

Bosch Plug

used by 9 of the 12 cars to finish that grilling 500 Mile Race.

Buy Bosch—and Be Satisfied

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BUDA MOTOR

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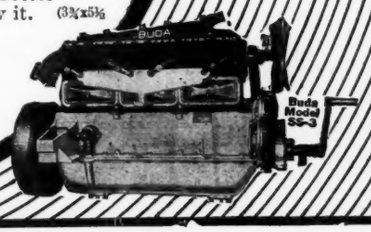
The moving parts of a good piece of machinery do not touch each other. They rest on a film of oil. To have all frictional surfaces far enough apart to admit a tiny film of oil, yet close enough together to make a perfect fit means dealing in thousandths and ten-thousandths of an inch. The experience, skill and conscience to do this means "best that can be built." *And that's the kind of motor the BUDA is.* In our plant "approved" means "not susceptible of improvement."

The Wonderful Buda Six

while no better than the other Budas is especially popular just now owing to the rise of the Six in general. If the salesman who sells you your next car tells you there's a Buda Six under the hood, you can buy with the assurance that NO CAR you'll ever meet (regardless of price) will have a better motor. No such thing exists, and car makers know it. (3¾x5½



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FACTORY, HARVEY ILL., (Chicago Suburb)
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"Gibson Quality"

Master Vibrators

Bigger Profits for You!

Here are the Master Vibrators that will make you more money. "Gibson Quality" Master Vibrators combine the excellent and desirable features found in ALL other high grade vibrators. Not only this, but all the questionable and undesirable features have been completely eliminated. Not one piece of mechanism goes into a "Gibson Quality" Master Vibrator until it has been carefully and thoroughly tested and its value proven.

In appearance, operation and workmanship these master vibrators cannot be equalled at any price. Furthermore, they are guaranteed absolutely and without reserve.

This instrument is an improvement over anything of its kind. It has guaranteed iridio platinum points hardened over a special process. This gives them extremely long life—and—in spite of the wonderful service and value offered—the price is much lower than any other instrument in its class.

Dealers all over the country are recognizing the money making opportunities in "Gibson Quality" Master Vibrators. You should write today for further particulars—or, better still, send for one—if it fails to meet our claims—return it—you cannot lose.

Our 1914 motor accessory catalogue is an invaluable asset to YOUR business.

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Home of the Cleveland Automobile Club

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and prove it to him by showing a printed record of actual working time on his job, made by

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It records *Elapsed Time* and never makes a "clerical error."

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"They look better,
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They *are* better."

GAULOIS TIRES

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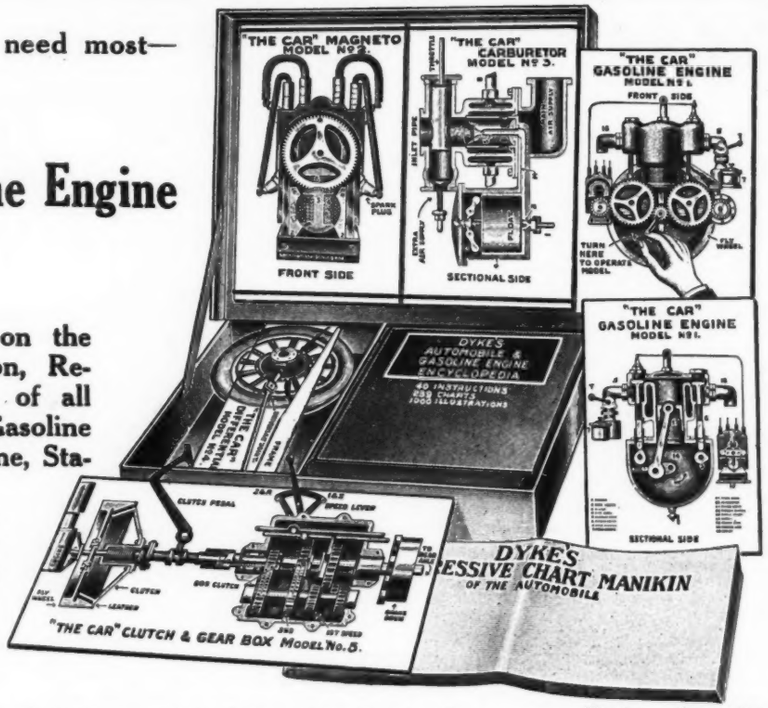
Here it is—just the thing you need most—

Dyke's Automobile & Gasoline Engine Instructor

A Practical Instructor treating on the Principle, Construction, Operation, Repairing, Troubles and Remedies of all Automobiles and all types of Gasoline Engines: Auto, Motorcycle, Marine, Stationary and Aero.

A NEW IDEA invented by A. L. Dyke, the originator of the first automobile supply business and publisher of the first practical book on automobiles in America. Endorsed by Lord Montagu, the leading motor authority of England, and Chas. Duryea, Chas. Splitdorf and others. Simple, Thorough, Practical. Prepared for the NOVICE, but a handy guide and reference for the EXPERT.


"THE CAR" MAGNETO MODEL No 2.
FRONT SIDE
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"THE CAR" GASOLINE ENGINE MODEL No 1.
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DYKE'S AUTOMOBILE & GASOLINE ENGINE ENCYCLOPEDIA
40 INSTRUCTIONS
600 CHARTS
1000 ILLUSTRATIONS
"THE CAR" DIFFERENTIAL MODEL No 4.
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DYKE'S PROGRESSIVE CHART MANIKIN OF THE AUTOMOBILE

Dyke's Automobile & Gasoline Engine Instructor. Price $8.50

DESCRIPTION

ON THE WORKING MODELS YOU GET THE ACTUAL PRACTICE, see the actual INSIDE operation and learn the principle. The Instructions then explain and illustrate the variance in construction of the different parts in general use.

With these Models you learn more than you could from the real part itself because you see the inside operation—something impossible with the real part.

THE MODELS OPERATE BY HAND, ALL MOVING PARTS MADE OF REAL METAL. There are two sides to three of the models.

ON THE No. 1 ENGINE MODEL you learn the principle, then valve operation and how to set the valves. The same applies to all other models.

THE PROGRESSIVE CHART MANIKIN EXPLAINS WITH LARGE PROGRESSIVE DRAWINGS HOW THE AUTOMOBILE IS BUILT FROM THE GROUND UP; First the springs are mounted on the axles, then the frame on the springs, then the power plant on the frame, then the transmission and drive system, and so on until the car is completed. Key numbers of parts are referred to throughout the instructions.

THE ENCYCLOPEDIA contains 560 pages, 239 Charts and over 1000 Illustrations. It is divided into forty instructions, as follows:

Assembly of the Car, Drives, Steering Springs & Brakes, Axles & Differentials, Clutches, Transmission or Change Gears, The Gasoline Engine, Engine Parts, Valve Timing, How Cylinders Fire, Two Cycle, Carburetion, Self Starters, Electric Ignition, Low Tension Coil, High Tension Coil, Wiring, Ignition, Timing, Various Ignition Systems, Low Tension Magneto, High Tension Magneto, Magneto Principle, Magneto Wiring, Magnetos Setting & Troubles, Storage Batteries, Lighting a Car, Cooling, Lubrication, Operating a Car, Rules of the Road, Care of the Car, Tires, Vulcanizing, Building a Garage & Repair Shop, Equipment, Tools, Use of Tools, Repairs & Adjustments, Digest of Troubles, Diagnosis & Remedies, Insurance, Laws, Horsepower, Tables, Measurements, Steam Car, Air Crafts, Pointers for Automobile Salesmen, Dictionary, Index.

EACH AND EVERY SUBJECT IS COVERED IN DETAIL WITH CLEAR ILLUSTRATIONS AND SIMPLE EXPLANATIONS—for instance: The Engine Subject covers all engines from 1 to 8 cylinder, explains the different valve systems and cylinders and crank shafts.

THE CARBURETION SUBJECT covers, first the principle of Carburetion, then the different constructions, and finally ends with clear detail rules for adjusting all leading carburetors.

THE ADJUSTMENT AND REPAIR INSTRUCTION is probably the most interesting. The subject of repairing begins with cleaning a car; cleaning carbon, chemically and mechanically; grinding valves; testing compression; taking up lost motion in valve stems and plungers; setting valves and timing the ignition; how to set all leading magnetos; scraping bearings; how to test for knocks and how to locate them; meshing the timing gears; fitting piston rings; carburetor repairs and adjustments; rewiring a car; ignition troubles and remedies; timer troubles and remedies; cooling troubles—how to clean and repair radiators; how to take up wear in differential; how to adjust the steering device; how to treat the clutch; lining up wheels, etc. In fact, every adjustment needed on a car is explained and fully illustrated.

THE INSTRUCTION ON SALESMANSHIP gives many pointers to the auto salesman in the way of advantages and disadvantages of different systems of ignition, carburetion, engines, etc.

THE INDEX AND THE DIGEST OF TROUBLES—With this Index the reader can find any trouble the auto is heir to, then turn to the Digest of Troubles and learn the cause and remedy, and then turn to the Repair Section and see how to repair it, or turn to the Instruction and learn the principle and construction.

VALUE OF THIS INSTRUCTOR TO YOU. It will train you to become:

(1) AN ENGINE EXPERT capable of diagnosing ignition, carburetion, valve timing, cooling troubles, and remedying them.
(2) A DIAGNOSIST—who from knowing the principle and construction of all these subjects can instantly tell the cause of any trouble and apply the remedy.
(3) A RUNNING GEAR EXPERT capable of diagnosing and remedying such troubles as differential, transmission, axles, brakes, steering wheels and axle troubles.
(4) AN AUTO MECHANICIAN who can adjust and remedy all the troubles after diagnosing—the subject of repairing in this Instructor is complete in every respect.

YOU CAN'T AFFORD TO BE WITHOUT DYKE'S AUTOMOBILE AND GASOLINE ENGINE INSTRUCTOR.
THE INSTRUCTOR CONSISTS OF:

5 Working Models
Progressive Chart Manikin
Book—Dyke's Automobile and Gasoline Engine Encyclopedia.

PRICE of the Dyke Automobile and Gasoline Engine INSTRUCTOR, as shown above, complete in a special box—$8.50. (Add 60c if wanted prepaid.)
NOTE:—The Book—Dyke's Automobile and Gasoline Engine ENCYCLOPEDIA can be purchased separately, if desired. Price—$3.00. (Add 25c if wanted prepaid.)
NOTE:—THE 5 WORKING MODELS can be purchased separately from the Instructor, but in sets of 5 only. Price for the five—$5.75. (Add 48c if wanted prepaid.)

BOOK DEPARTMENT **THE AUTOMOBILE** 231 West 39th St. NEW YORK CITY

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DON'T LET VIBRATION DEVILS PICK YOUR CAR TO PIECES

Make Your Springs Perfect Vibration Absorbers by Installing

The DANN OIL CUSHION SPRING INSERT

"The Insert of 10,000 Oil Pockets"

It Insures Your Car for Life Against Squeaky, Dry and Rusty Springs

Write for free booklet, handsomely illustrated, on "Why Cars Wear Out"

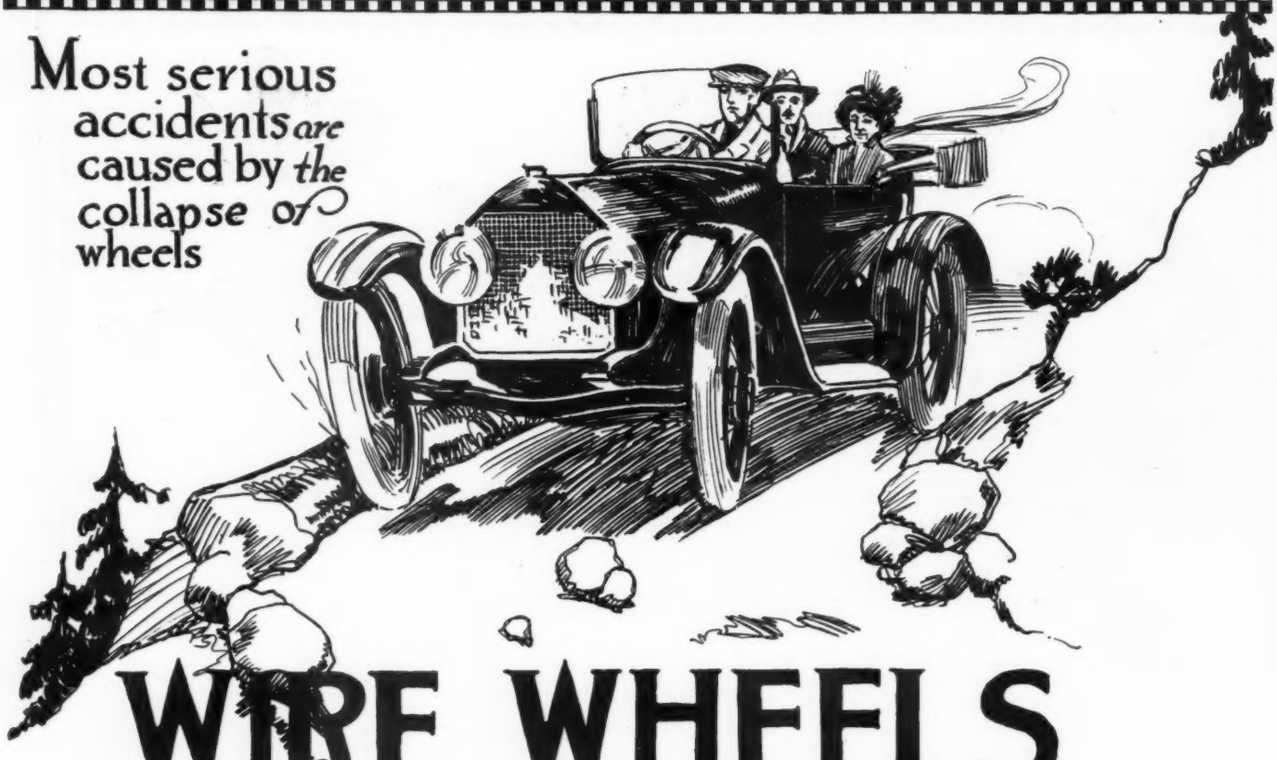
"Oil Cushionize Your Springs!"

Dann Oil Cushion Spring Insert Company

2280 Indiana Avenue, Chicago, Illinois

The Insert of 10,000 Oil Pockets

Most serious accidents are caused by the collapse of wheels



WIRE WHEELS *Can't Break*

You want wheels on your car which will not break—no matter how hard the jolt or how violent the skid.
This is the first and greatest reason why all cars should be equipped with wire wheels—the real "Safety First" of motoring.

HOUK DETACHABLE WIRE WHEELS are made with the triple spoke lacing, a construction now recognized to be superior to any other. This principle, combined with the care and skill of manufacture and the use of the best materials, gives HOUK DETACHABLE WIRE WHEELS their great strength—a strength that defies breakage. The worst that can ever happen to wire wheels is bending.

Added to the *safety* which HOUK DETACHABLE WIRE WHEELS insure, there is the greatest convenience in changing whenever tire trouble occurs. It is many times easier to change an entire wheel than to change a tire—especially as you need only loosen one nut—slip on your spare wheel—tighten one nut—and go on.

GUARANTEED FOR THREE YEARS

MADE BY
HOUK MANUFACTURING COMPANY, BUFFALO, N. Y.

FOR
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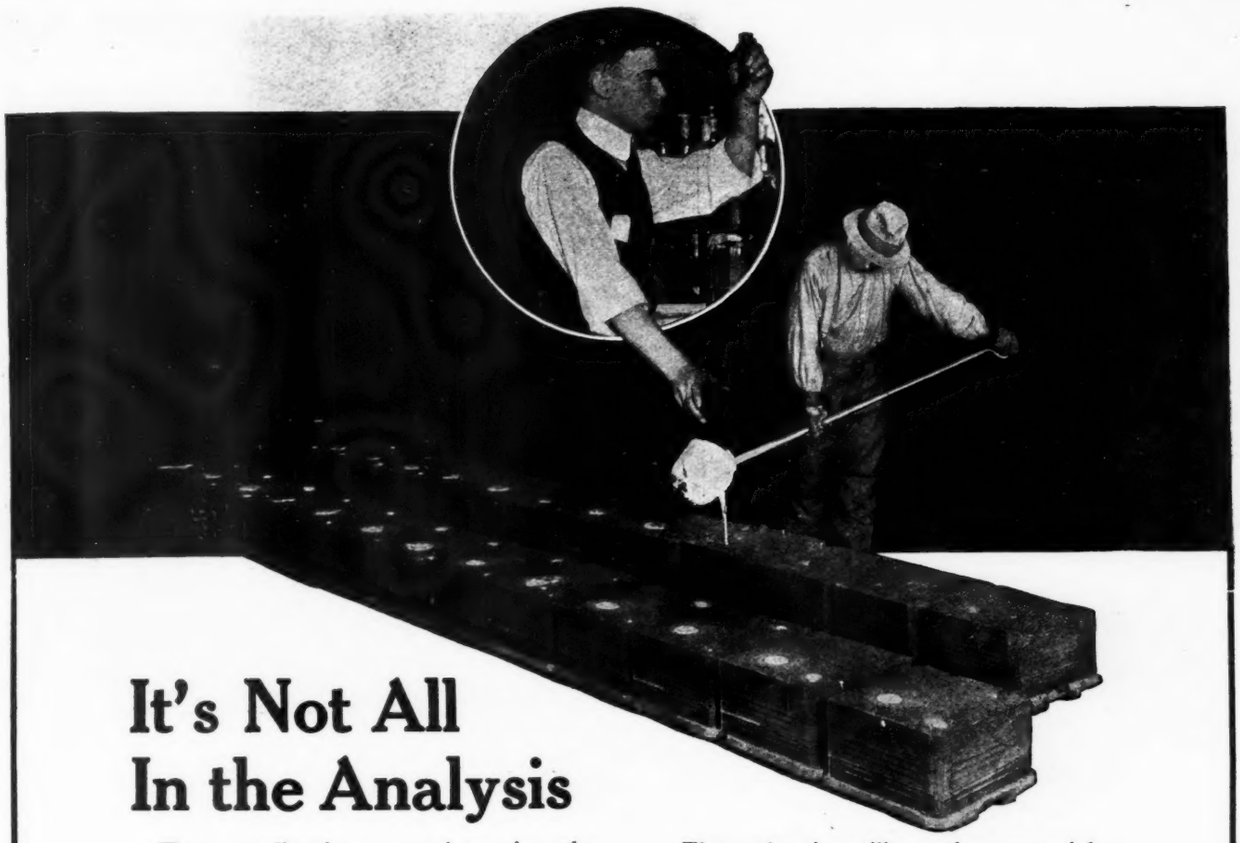


It's Not All In the Analysis

The metallurgist must determine the proper mixture of metals for your castings, of course. But a slight error in foundry practice may upset his calculations. Good castings and reliable delivery are possible only when you can depend on absolute technical control of every foundry operation.

This control regulates the proper conditions for melting and pouring to assure uniformity in tensile strength. It is a factor in making molds and cores, and is largely responsible for the accuracy of the finished casting.

To the layman, such things as the right consistency of cores and molds for different pouring temperatures are small matters, but without most careful supervision they make satisfactory results impossible.

Then there's still another essential—foundry efficiency. You can plan a thing and supervise its manufacture, but your workmen must know how to do their work in the easiest and best way to produce good results, and make delivery on schedule time.

Our foundry work is so arranged that each workman does that which he can do best—and nothing else. A skilled molder wastes no time in shoveling sand. Each man's work is studied, improved and made easier. As a result he accomplishes more in a given time and you get the benefit of his increased skill.

This kind of efficiency enables us to look ahead and prevent mistakes before a job is begun, and to look back over accurate data compiled from previous jobs and tell you when your castings will be delivered and how much they will cost.

The Aluminum Castings Company

LYNITE and LYNUX Castings

Cleveland Detroit Buffalo Manitowoc, Wis. Fairfield, Conn.

Address correspondence to 6201 Carnegie Avenue, Cleveland, Ohio.

LYNITE

"More than an Alloy"

LYNITE is the name of a group of aluminum alloys. The analysis may differ according to the specific use of the casting; but the technical control, foundry efficiency and resulting assurance of quality and delivery are the same in every case. The application of LYNITE to automobile parts and many other uses, is increasing very rapidly. Light, strong and reliable, it may solve a manufacturing problem for you. Tell us what you are doing and see if we cannot help.

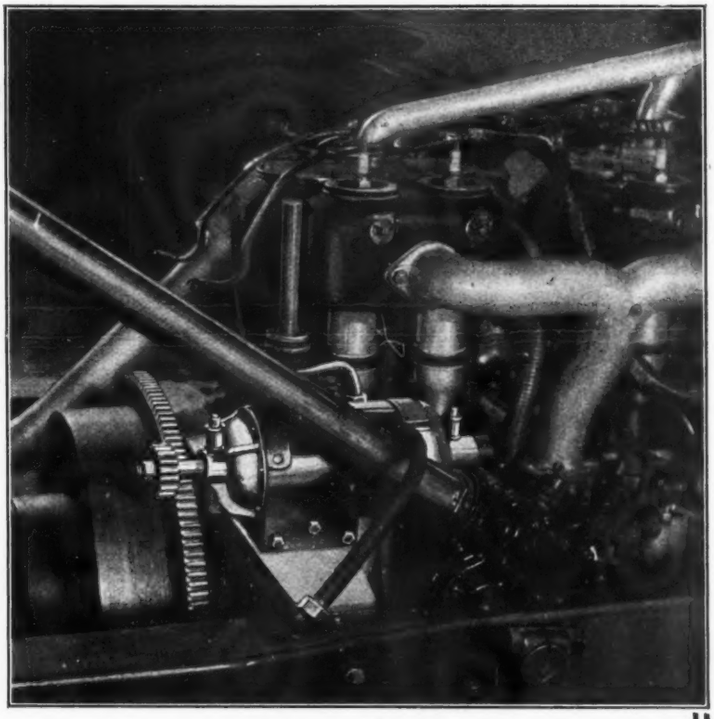
LYNUX

"More than an Alloy"

The same equipment, organization and efficiency as in the case of LYNITE, apply to LYNUX Brass and Bronze. Let us figure on any work you have in hand.

We have the plant-equipment to handle the most intricate and difficult castings in any quantity, backed by years of experience with brass and bronze, and the most thorough research into the character and uses of all alloys of aluminum. You are cordially invited to call at any of our plants and see what we are doing.

Easy to Install



We could multiply examples showing the ease and simplicity with which the Rushmore Starting and Lighting System is attached to engines already built.

The accompanying photograph and letter tell their own story of easy attachment and economical operation. No intermediate gears, you'll notice!

Just stick a pin in that current consumption—50 amperes from an 8-volt 150 A. H. battery to spin a 4¾ x 5½ four-cylinder engine at 137 R. P. M.! That is equivalent to about 70 amperes from the ordinary 6-volt 120 A. H. battery.

Compare it with whatever figures you have regarding other starters.

The RUSHMORE STARTER

FEDERAL RUBBER
MANUFACTURING COMPANY
Milwaukee, Wis., 5/16/14.

RUSHMORE DYNAMO WORKS,
Plainfield, N. J.

Gentlemen:

Your letter of April 3rd acknowledging two photographs forwarded to you showing the installation of a Model C starter as applied to a Stutz engine has been held awaiting certain information in order to give you the necessary reply. If the information and the photographs which we are giving to you can be used in your advertisements, we are very pleased indeed to give you this information and photographs for that purpose.

The starter is applied to a Stutz four cylinder engine, cylinder size being 4¾ in. bore by 5½ in. stroke. In fitting this starter to the engine it is necessary to shrink a gear ring on the outside of the flywheel; this gear ring 19¾ in. P. D., 8 pitch, with 158 teeth and ⅞ in. face. The motor pinion is made of cut steel 2 in. P. D., 8 pitch, 16 teeth, with the teeth on the engaging end pointed, so that they more readily slip into mesh, without noise or jar.

I quote hereafter a memo given to me by the electrician in our plant.

"Regarding the starter on your Stutz car, would advise that it takes 200 amperes at 7 volts for 2½ seconds, then drops to 50 amperes for 1 second, then releasing, and in the meantime is turning the engine at the rate of 137 R. P. M."

I presume that if the gasoline motor did not start the electric motor would continue to draw 50 amperes to keep it turning, but his test is made allowing the gasoline motor to start, thus disengaging the electric motor. A Rex 150 ampere hour battery is used.

Trusting I have given you the desired information, I am,

Yours very truly,

HAG—RC H. A. GITHENS.

RUSHMORE DYNAMO WORKS *Plainfield, N. J.*

One of the Most Necessary Things for Your Car is a Stewart Tire Pump

PEOPLE are sick and tired of blowing up tires with hand pumps, and yet your tires *must* be kept up to proper pressure, or you suffer expense and inconvenience. What car owners want is a reliable, efficient tire pump mounted on and driven by the motor.

You may carry one extra, inflated tire, but if you have *any* tire trouble *someone* has got to blow up that tire *sometime, somewhere.* Many car owners are buying Stewart Tire Pumps and attaching them themselves, or having the installation made by dealers and garage men, and so are relieving themselves of this awful hoodoo of tire troubles.

Double air valves, insuring positive operation
Cylinder beautifully machined fins mean perfect cooling
Air intake screen
Piston oiled by oil-soaked wick
Crankshaft oil hole
Clutch
Hardened steel shaft

Don't fool any more of your strength, time and patience away on hand pumping. The Stewart Tire Pump only costs $15. It pumps up a big tire in five minutes or less. It is mounted on and connected with your motor, and all you have to do is to push over a little lever, and look on until your tires are blown way up to *proper pressure.* The Stewart Tire Pump makes it *easy* to keep your tires inflated to the pressure *stipulated by the maker,* thus avoiding rim-cutting, breaking of fabric and other evils of a soft tire.

The Stewart is the most efficient, finely finished, reliable tire pump you can get. The piston is steel; the connecting rod hardened steel; the cylinder beautifully finished, having fins for perfect air cooling. The piston is oiled by rubbing against a wick, upon which oil is dropped from the outside. This is the *only* piston pump that absolutely prevents oil from getting into tires. No rubber or leather packings to wear out and cause leakage. The base is aluminum.

Price complete with air-pressure gauge and 12 feet of high-grade hose, only - - - - - -

$15

Be sure that there is a Stewart Tire Pump on the new car you buy.

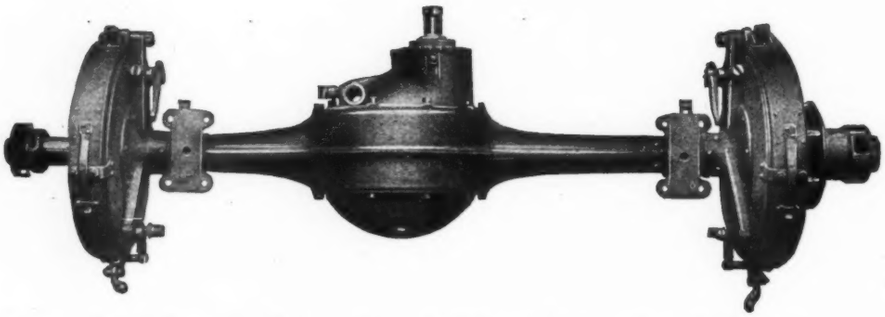
Stewart-Warner Speedometer Corporation

Executive Offices: 1964 Diversey Boulevard, Chicago

Factories: Chicago and Beloit, Wisc.

17 Branches. Service stations in all cities and large towns.

"American" Axles



The Highest Standard Yet Reached In Automobile Rear Axle Construction

Efficiency ratings established by laboratory, block and road tests prove that "American" Axles transmit a larger proportion of power than any other axle.

Durability tests, taken from actual records extending over many years of service, prove that in addition to their superior design and workmanship, "American" Axles are constructed of materials which show longest life with a minimum of wear.

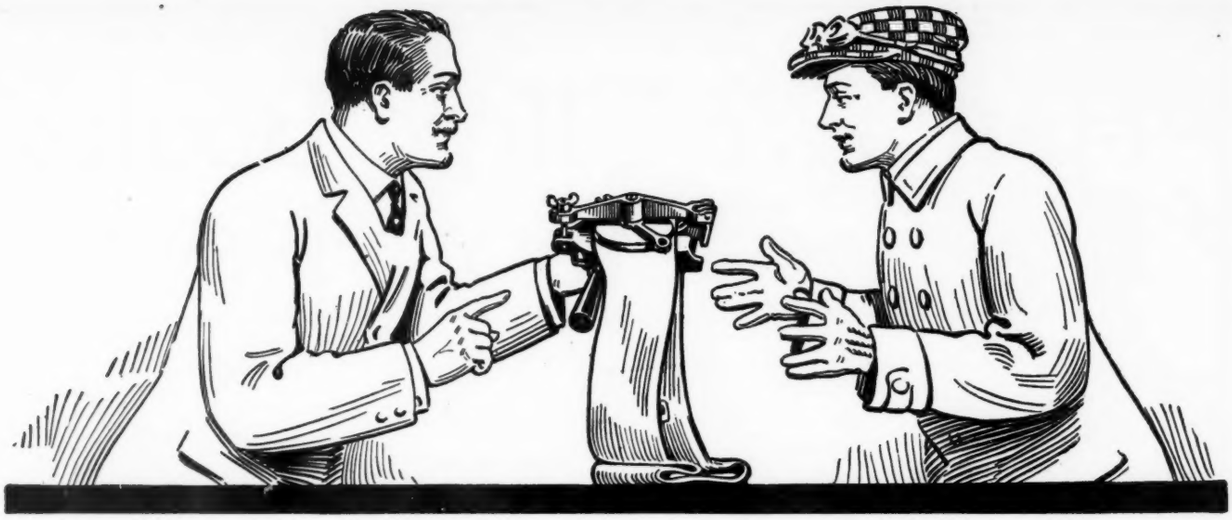
First cost, with "American" Axles, is virtually last cost, because they maintain their marvelous efficiency far beyond the average life of even the best made motor cars.

It is because of this economy and unparalleled length of service that "American" Axles are found on gasoline and electric pleasure cars of the highest grade.

Licensed Under The Kardo Company Patents.

The American Ball-Bearing Company

Cleveland, Ohio



Keep Your Tires in Good Condition with a SHALER Vulcanizer

You can repair any puncture, blow-out, tear or hole in any casing or inner tube—anywhere—in a few moments with a Shaler Vulcanizer. It vulcanizes thoroughly and makes the repair the strongest part of the tire. Every Shaler has automatic heat control which makes it impossible to overcure or undercure the tire. The Shaler does not need to be watched. It works automatically. Simply clamp the Shaler Vulcanizer on your tire and it does the rest. A boy can operate it.

The Shaler is the Standard Vulcanizer used by the best garages and repair shops everywhere. We make the only complete line of vulcanizers, from the small vulcanizer for motorists' use at home to complete Garage Equipment. We are the largest manufacturers of vulcanizers in the world and our complete line includes vulcanizers of every type—Electric—Gasoline—Alcohol and Steam for every requirement.

Shaler Safety Vul-Kit $3.50

The Safety Vul-Kit is designed to meet the motorist's requirement for an inexpensive outfit that can be carried in the tool box for emergency repairs to tubes and casings. It mends tube punctures and small casing cuts as perfectly and permanently as the most elaborate outfit. Absolutely safe. Burns gasoline or alcohol—an exclusive Shaler feature. Avoids all flame, smoke and danger—can be turned upside down while in operation without spilling a drop of fuel. No watching, no regulating; simply fill the cut or puncture with new rubber, clamp on the vulcanizer—fill and light the generator. The fuel supply is limited to that required for perfect vulcanization. You can't overcure or undercure a repair. Tubes are clamped against the vulcanizing surface by a swivelled plate inlaid with asbestos to retain the heat and prevent pinching the tube. You can't accidentally spoil a repair or tube by clamping one side of the plate tighter than the other. Handle always cool, permits removing vulcanizer from tire as soon as repair is finished. Anybody can use it. Furnished complete with repair material—everything but the fuel. Fully nickeled—will last a lifetime. **Type G 32 Shaler Safety Vul-Kit, $3.50.**

Model D - 81 - $12.50

Shaler Model "D" For Motorists—$12.50

Operates from city lighting current. When ordering, state voltage of current and whether it is direct or alternating. The Model "D" is a safe, clean vulcanizer for the motorists own use at home. Any motorist or chauffeur can mend tubes and casings perfectly with it. The exact vulcanizing temperature is maintained by a thermostat which automatically makes and breaks the circuit—giving automatic heat control. There is no possibility of overcuring or undercuring the tire. No watching or regulating necessary. Easily attached to any electric light socket. It vulcanizes two tubes as quickly as one. Repairs Blow-Outs, Cuts, Tears, Punctures, etc. A 3½ by 7 inch repair can be made at one setting, and larger repairs by resetting. Heats in a few minutes and costs but one-half cent an hour to operate. Furnished with ten feet of conducting cord, U. S. Gov't tested heat gauge, Para Rubber, cement, and illustrated book of instructions. Finished in polished nickel. Price complete outfit, $12.50.

Send for our Free Book "Care and Repair of Tires"

This handy little book is brimful of practical information about automobile tires. It tells what to do for every kind of tire trouble—how to treble your tire mileage—how to get the most service out of your tires, and how to vulcanize and repair your own tires at home. The leading American and Foreign automobile publications quote "Care and Repair of Tires" as authority. We will gladly send a copy on request to any motorist, free of charge and without obligation.

C. A. SHALER COMPANY, 125 Fourth Street, Waupun, Wisconsin

Canadian Distributors, John Millen & Son, Limited, Toronto, Winnipeg, Montreal, Vancouver, Victoria

Here Are Three Books Every Motorist Needs

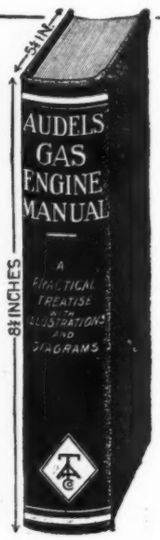
AUDEL'S GAS ENGINE MANUAL

This volume gives the most valuable information respecting the construction, care and management of *Gas, Gasoline and Oil Engines, Marine Motors and Automobile Engines*, including chapters on *Producer Gas Plants* and the *Alcohol Motor*.

The work is divided into 27 chapters. Each chapter is illustrated by diagrams which make it a thoroughly helpful volume, containing 512 pages, 156 drawings, printed in large, clear type on fine paper, handsomely bound in rich red cloth, with gold top and title, measuring 5¼ x 8½ inches, and weighing over two pounds.

The book is a practical educator from cover to cover and is worth many times the price to any one using a gas engine of any type or size.

Price—$2.00 Postpaid



AUDEL'S ANSWERS

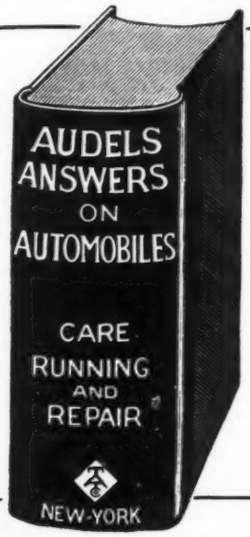
by

GIDEON HARRIS AND ASSOCIATES

This book is for owners, operators and repairmen.

Relating to

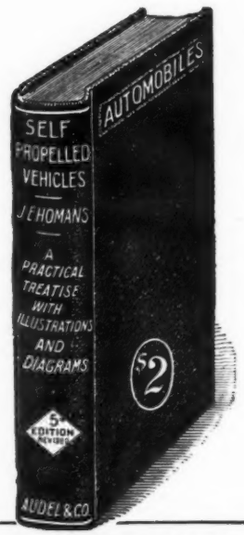
The parts, operation, care, management, road driving, carbureters, wiring, timing, ignition, motor troubles, lubrication, tires,



etc., including chapters on the storage battery, electric vehicles, motor cycles, overhauling the car, etc.

This volume contains over 500 illustrations and diagrams, 476 pages handsomely bound in cloth.

Price—$1.50 Prepaid



SELF-PROPELLED VEHICLES

By J. E. HOMANS

A good book for Owners, Operators, Repairmen and Intending Purchasers.

This work is now the accepted standard on the practical care and management of motor cars — explaining the principles of construction and operation in a clear and helpful way, and fully illustrated with many diagrams and drawings, making it of value to the intending purchaser, driver and repairman.

The subjects treat of the needs of the man behind the wheel, and are presented clearly, concisely and in a manner easy to understand by the reader, be he a beginner or an expert.

The treatise on the gasoline engine cannot fail to prove valuable to anyone interested in explosive motors, which are daily coming to the front as the readiest and most convenient source of power.

Contains 608 pages, over 400 diagrams and illustrations, printed on fine paper, size 5¾ by 8½ inches.

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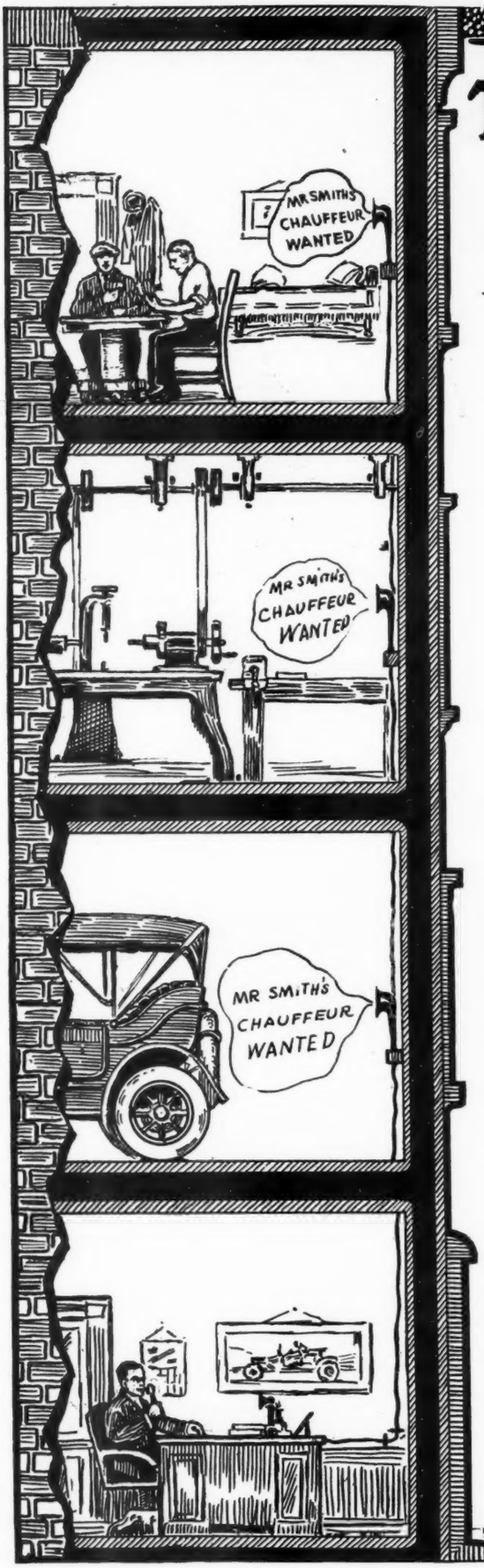


The STENTOR Autophone

WHEN a customer's car or chauffeur is called for, does some one in your garage have to rush around on one or more floors, losing valuable time in the attempt to locate what is wanted, or are you able, through the use of THE STENTOR GARAGE-PHONE, to speak to anyone in any part of your garage, or to announce your instructions on all floors at one time?

The installation of a GARAGE-PHONE will not only prove of tremendous convenience, but provides you with a demonstrating outfit and will show your customers the many strong and unrivalled features of the STENTOR AUTOPHONE for cars, which is operated on the same principles.

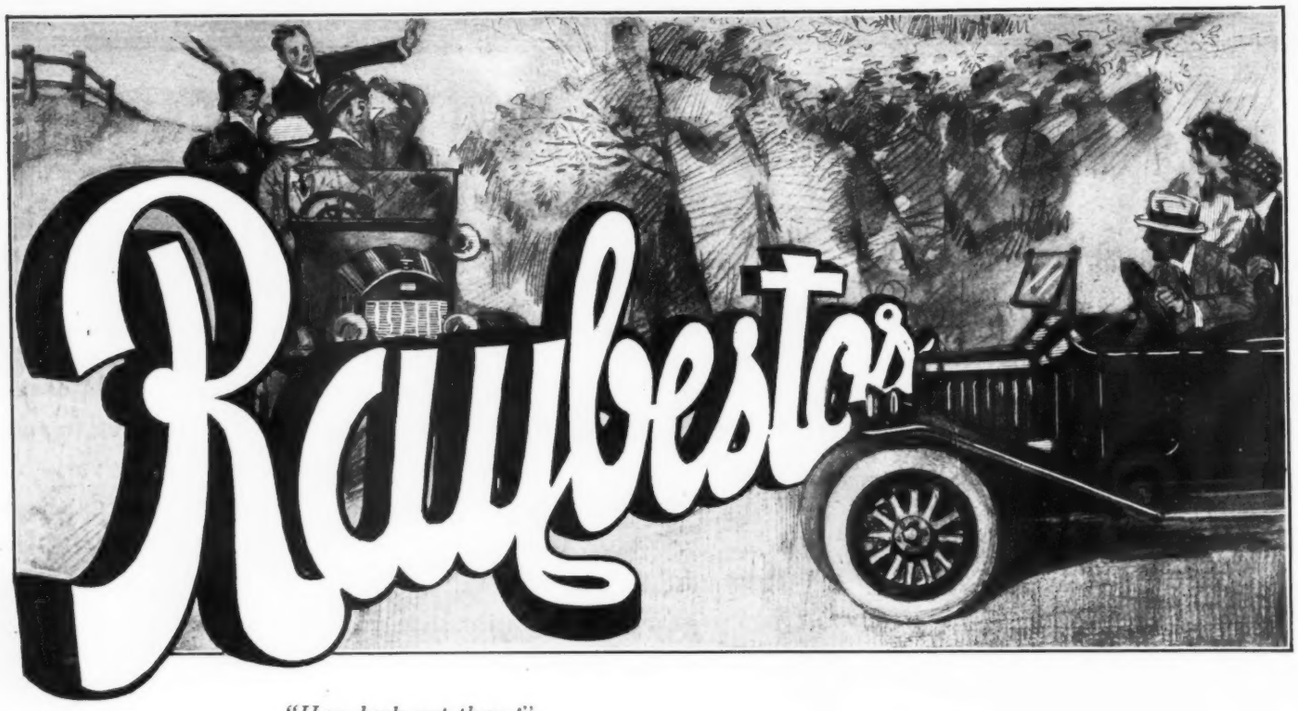
THE STENTOR AUTOPHONE does away with the unsatisfactory and unsanitary speaking tube, reproduces the voice clearly and distinctly without distortion, no matter what the noise of engine or traffic may be, and makes it possible for the chauffeur to receive his instructions without turning his head or taking his eyes from his work.

THE STENTOR AUTOPHONE OPERATES on any 6 or 8 volt dry cell battery or ordinary automobile storage battery. It consumes but one-tenth of the current required to operate any other system of this nature, obviating the frequent charging of batteries. It can be installed in an hour's time without disturbing the upholstery of the car, and is equally efficient for use on open or closed cars.

Your customers are prospective buyers of STENTOR AUTOPHONES. We want to reach them through you. We will make an exceptionally attractive co-operative selling agreement with a limited number of live-wire garage owners, whereby you, while acting as local dealer for us, can reap a handsome profit on the distribution of Stentor Autophones. We will also show you how you can install a garage-phone on a very economical basis. Write us today for full particulars. Secure your territory now.

Efficiency Sales Company, Inc.

42 Broadway, New York City



"Hey, look out there!"

"Oh, we're all right. My brakes hold like a stone wall ten feet thick."

"So do mine—mine are lined with Raybestos."

"Sure. Mine are, too."

Like a Solid Wall of Safety

You will never have an accident due to slipping brakes if your brakes are lined with Raybestos. Raybestos retains its tremendous gripping power even when worn down as "thin as a shadow," because it is made of **long fibre** asbestos and impregnated with our special treatment **in every shred.** Our exclusive patented process alone makes this possible.

The proof of Raybestos quality is this guarantee: If it fails to give a full year's service, we will furnish new lining without charge. No other brake lining has a definite guarantee.

Never forget that your car is no safer than its brake lining. Specify Raybestos. Insist on getting it. You will know it by the silver edges and the name on every foot.

THE ROYAL EQUIPMENT CO., 1354 Bostwick Ave., Bridgert,od Conn

TRADE MARK
Raybestos
REG. U.S. PAT. OFF.

A Plain Talk About Chalmers Policy

To Motorists Everywhere:

You who read Automobile regularly see a great many page and double-page automobile advertisements.

Many of these automobile advertisements read much alike.

The reason for this is the similarity in many respects between some of the most favorably known and most widely sold cars.

Chalmers Cars Are Different

Now Chalmers cars—the "Light Six" at $1800; the "Master Six" at $2175—are different from others because they are distinctively Chalmers—because they are built by Chalmers men in the Chalmers shops.

And we want to make this a different kind of an automobile advertisement if we can. We will leave out such words as "best," "greatest," "finest," "lightest," and so forth, and try to give you some definite idea of what there is about Chalmers cars that makes them different from others.

We will begin by making this statement, which you have never before read in any automobile advertisement:

We have never lost a sale to a prospective buyer who has seen the Chalmers "Sixes" being made in the Chalmers factory.

This tells you, first of all, that Chalmers cars are built complete in the Chalmers plant. No "assembling" company could make a statement of this kind, because to see an assembled car being manufactured, one would have to visit many cities and many factories.

Our statement tells you next that Chalmers quality is a definite thing which can be readily appreciated once you have seen the Chalmers methods of manufacture, and the materials which go into Chalmers cars.

Undoubtedly those who visit the different automobile factories before buying a car have an advantage over those who cannot. We will try, therefore, to tell you in detail what it is that makes those who visit the Chalmers factory buy Chalmers cars.

Chalmers Quality In-built

Probably the first thing that would impress you in the Chalmers plant is the fact that quality is something that must be "built in" an automobile. You would see that this quality means painstaking workmanship by skilled mechanics; rigid inspection; up-to-date machinery, and high grade materials.

In the Chalmers factory you would be impressed with the fact that Chalmers cars ***must*** be of high quality to protect the Chalmers investment. The Chalmers Company is in business to ***stay***. You would see 30 acres covered with big, permanent buildings, which have more than a million square feet of floor space. These buildings and land are owned free from encumbrance by the Chalmers Company.

Nearly 4,000 trained employees work in Chalmers shops.

As you walked through the Chalmers plant you would see that every important part that goes into a Chalmers car is built in the Chalmers works.

Public Will Decide

Just now there is considerable discussion on the subject of automobile weight. You may remember that there was some discussion about power a few years ago.

The public settled the question of horsepower—as it will eventually settle the question of weight.

Buyers did not want extreme high power. They did not want extreme low power—***they wanted medium power.***

In the same way the public will ultimately decide that overweight means ***excessive*** upkeep. The public will also decide that underweight means ***lack of strength and easy riding qualities.***

It costs money to pull useless weight, but it costs more money to repair broken parts whose strength has been sacrificed in the rush to get aboard the light car "band-wagon."

The people who buy Chalmers cars are settling the weight question ***now.*** They are settling it ahead of others in the way that it will be eventually settled—by purchasing medium weight cars.

In Chalmers cars there is no skimping at expense of safety and strength.

All parts that should be big and strong are made big and strong. We save on weight where weight is not needed for safety.

And no lighter car than the Chalmers uses better materials. We use as good materials as money can buy, and we don't overweight any part of our car because we don't like to spend money uselessly for materials any more than you would like to have us.

It is only because the Chalmers Company is satisfied with a small profit per car that we are able to build such values into our product at Chalmers prices. Our profit on the $1800 "Light Six" is less than $100 per car. And you pay one profit only when you buy a Chalmers. For we build our own parts—do not purchase them outside.

We know of no other company marketing cars of the Chalmers price and quality that takes as small a profit.

We Are in Business to Stay

As we have often stated in Chalmers advertisements, we are in business to stay. We are not trying to get rich in a hurry. We believe that by building quality into Chalmers cars, by giving the utmost for the money and by being content with a small profit per car, but with a big production, we have found the surest way to maintain a big and permanent volume of business.

We know that quality counts. So we believe it will be even easier to sell Chalmers cars in two or three years than now. We are building for the future—and so we build quality first. Price comes afterward.

If you are considering a car below the Chalmers price don't let $100 to $300 stand in the way of your getting a real quality car easily worth many times the extra cost in value and service.

We would not reduce the quality of Chalmers cars to meet "price." It may be necessary to raise the prices of our cars later in the season. We shall certainly not lower the quality.

Chalmers Dealers Now Delivering 1915 Models

If you will visit the nearest Chalmers dealer, he will show you more ways in which the Chalmers cars differ from others. He will be glad to give you a searching demonstration of the $1800 Chalmers "Light Six," or the $2175 Chalmers "Master Six," that will be a revelation to you.

1915 Chalmers "Light Six" Touring Car.$1800
1915 Chalmers "Light Six" Coupélet.... 2050

CHALMERS MOTOR CO. Detroit, Mich. U.S.A.

Chalmers "Master Six" 5-passenger.....$2175
Chalmers "Master Six" 6-passenger..... 2275

Quality First

Chalmers Motor Company, Detroit

$9.50 to $15.00

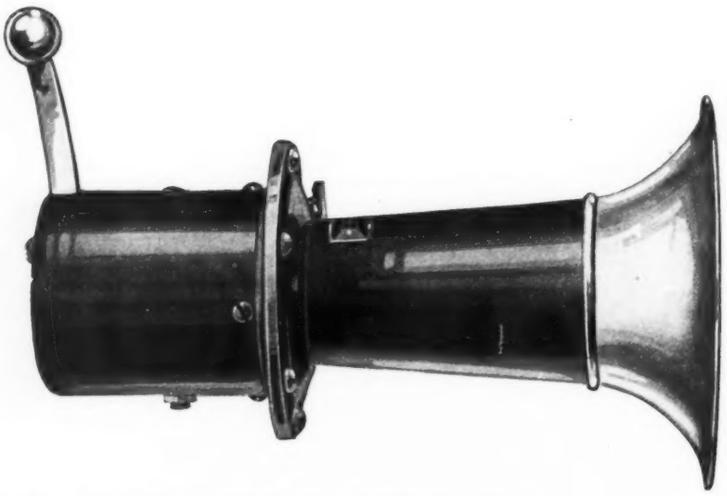
SPARTON

Electric Motor Driven and Hand Operated Signal

The motorist cannot afford to depend on a good enough warning signal. When the time comes for action, he must have a horn that will compel quick, unthinking, instantaneous jumping—such is the discordant, action-compelling growl of the SPARTON when the button is pushed home. On country stretches a good pressure on the button produces a warning clarion that can be heard a mile down the road, giving everyone time to get out of the way. On city streets a light touch produces an inoffensive, but authoritative command, warning people at close range.

Hand Operated

$7.00 and $8.00



Hand Operated

$7.00 and $8.00

THE SPARKS-WITHINGTON CO., - Jackson, Mich.

Please mention The Automobile when writing to Advertisers

reedom
from Gear Shifting Troubles

Here, at last, is a solution of the Gear Shifting problem; solved ***electrically,*** in a simple and satisfactory manner by the

VULCAN ELECTRIC Gear Shift

Here are some of its advantages:

1—It is easy to operate. No stooping over; no muscular effort required; a woman can operate it as easily as a man. Merely push the button and press the clutch pedal, and the magnet in the transmission responds with an instantaneous pull of 120 pounds.

2—It can be operated without removing the hand from the steering wheel or the eyes from the road ahead.

3—It enables gears to be shifted literally with a lightning-like speed, a great advantage when worming one's way through congested traffic or driving in rough, mountainous country.

4—It enables the driver to anticipate speed changes without actually changing speed until ready to do so. The electric circuit to the gear shifting magnet is completed only when the clutch pedal is pushed ALL THE WAY DOWN. Pressing one of the selective push buttons or slipping the clutch produces no effect, but pressing a button and pushing the clutch all the way down shifts the gears instantly.

5—The clutch must always be fully disengaged and the gears thrown to the neutral position, mechanically, before a shift can be made, thus making it impossible to strip a gear.

6—The amount of current required to operate a Vulcan Electric Gear Shift is very slight, as the current is consumed only at the instant the gear shifting solenoid is energized.

7—The Vulcan Electric Gear Shift provides the one thing needed to make the gasoline vehicle an electrically controlled car. The starting crank has gone. The hand lever gear shift is following it. THIS IS THE AGE OF ELECTRICITY.

The Vulcan Electric Gear Shift will be the sensation of 1915.

Get full particulars from the

Vulcan Electric Gear Shift Dept.

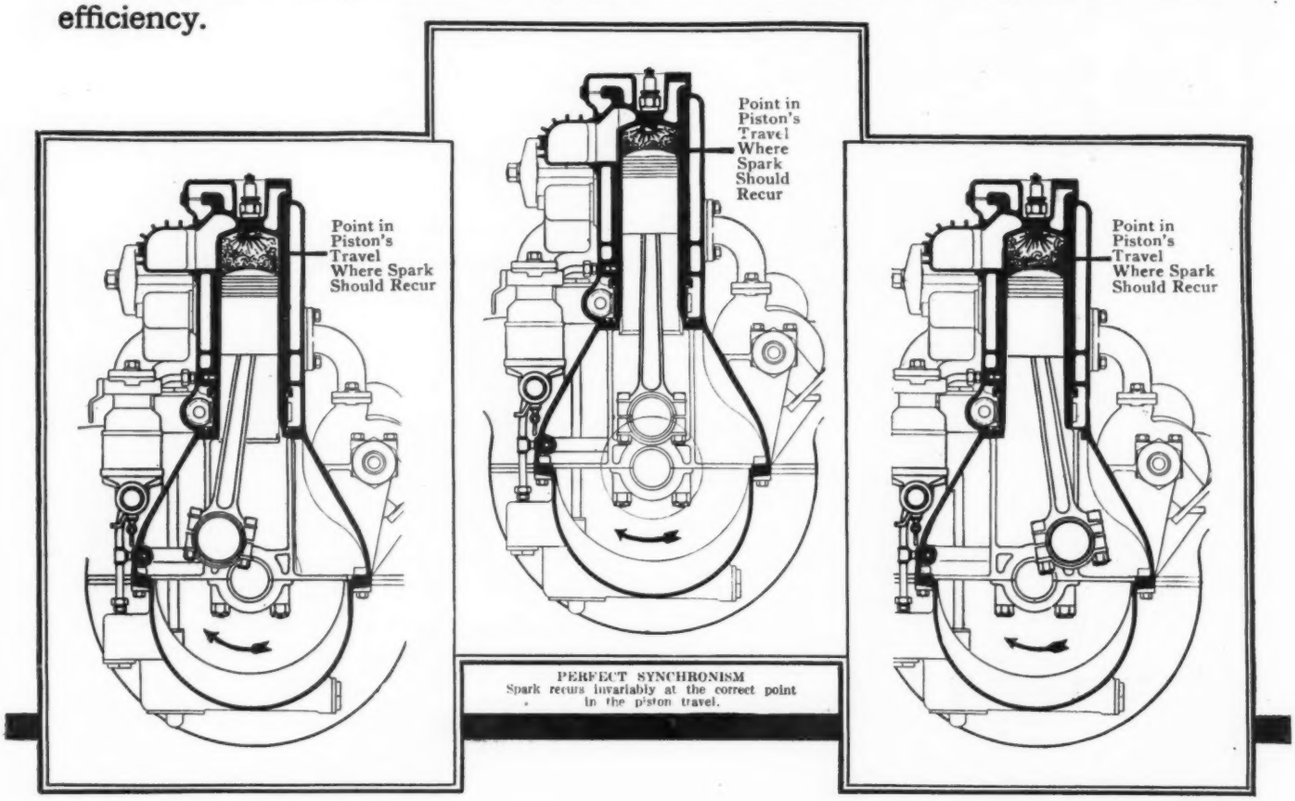
The Cutler-Hammer Mfg. Co. **Milwaukee, Wisconsin**

CONNECTICUT AUT

Dynamometer tests establish the truth of our claims that the spark produced by Connecticut Automatic Ignition is more effective under service conditions than the magneto's spark.

Besides the quality of the spark produced, there is another vital factor to be established—***synchronism***—before increased motor efficiency will result, for the greatest horse-power can be obtained only when the spark occurs at a fixed point in the piston's travel.

The rapidity of flame propagation or the time consumed in igniting a full charge of gas is as much dependent upon synchronism as upon the efficiency of the spark. Rapid flame propagation has a direct bearing upon motor efficiency.


Point in Piston's Travel Where Spark Should Recur
Point in Piston's Travel Where Spark Should Recur
Point in Piston's Travel Where Spark Should Recur

LACK OF SYNCHRONISM
Loss of power always results from a spark occurring too early.

PERFECT SYNCHRONISM
Spark occurs invariably at the correct point in the piston travel.

LACK OF SYNCHRONISM
Loss of power always results from a spark occurring too late.

All high tension ignition is based on a break in the primary circuit; that is, the high tension spark should occur simultaneously with the break in the primary. However, three factors, which may or may not require time for their accomplishment, enter after the actuating mechanism in the primary circuit is set for firing and before the explosion occurs. They are——

FIRST: The time consumed in mechanically accomplishing the break.

SECOND: Induction lapse, or the difference in time between the break in the primary and the occurence of the high tension spark.

THIRD: The rapidity of flame propagation dependent on the quality of the spark.

This time factor is known as ***lag***, and if it is variable, up to the point where flame propagation starts, it is a serious menace to synchronism.

These are almost intangible factors, but none the less vital. They can be eliminated only by perfection in such elements, both mechanical and electrical, as control them.

In the design and makeup of Connecticut Automatic Ignition the first consideration was the perfection of the actuating mechanism. There is only one rotary relationship in its breaker box to be established and it is the same in all positions. The action of accomplishing the break in Connecticut Automatic Ignition is direct with

OMATIC IGNITION

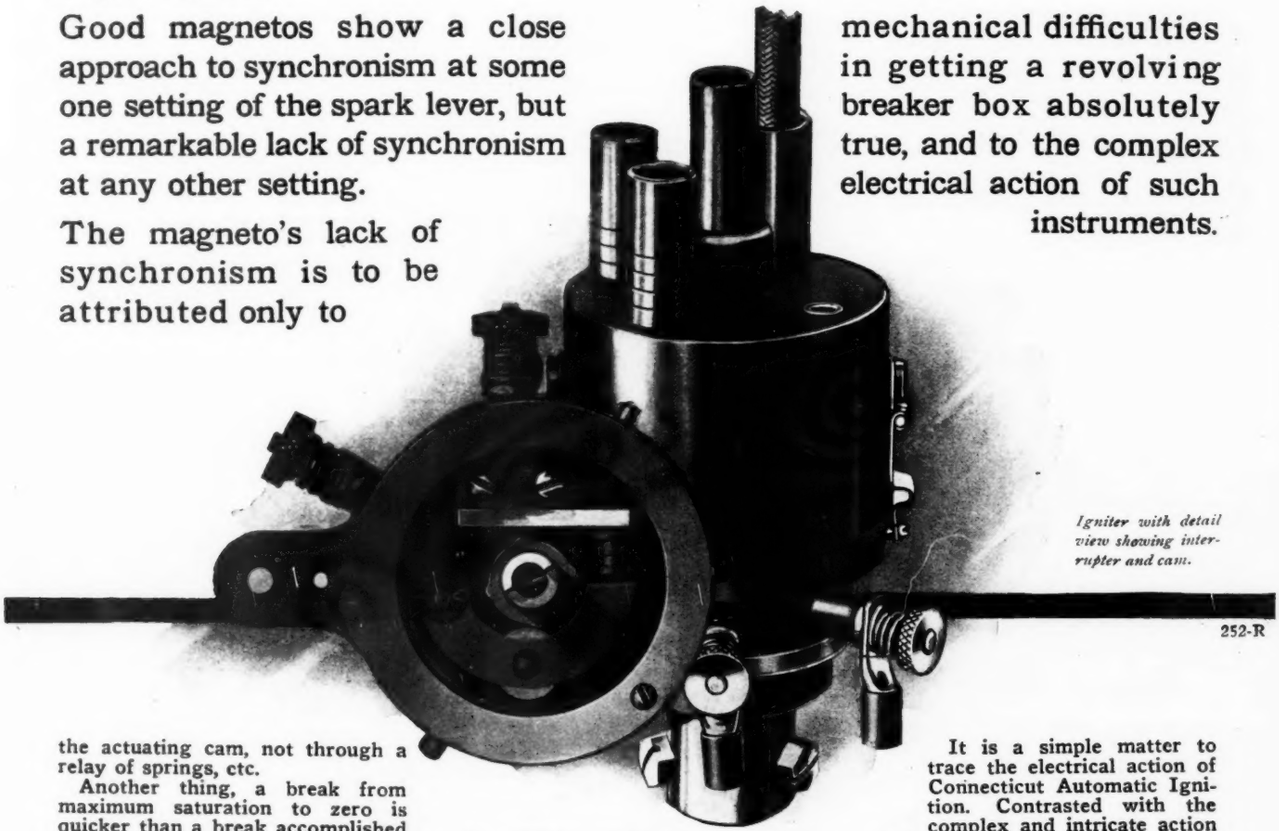
Connecticut Automatic Ignition gives absolute synchronism under every service condition. Simplicity is the dominating characteristic of both its mechanical and electrical action.

Synchronism means that the action of the ignition system, in relation to the action of the motor it serves, is practically perfect—in other words, the spark delivered by an ignition system, working synchronously, must recur invariably at a fixed point in the piston's travel with a certain spark adjustment.

The direct way in which the igniter breaks its primary circuit—the way it reduces induction lapse, or the difference in time between the break in the primary and the occurrence of the high tension spark, to absolute zero—and the rapidity with which its intense spark fires the charge of gas leaves no opportunity for either mechanical or electrical lag to accrue—regardless of engine speed.

Good magnetos show a close approach to synchronism at some one setting of the spark lever, but a remarkable lack of synchronism at any other setting.

The magneto's lack of synchronism is to be attributed only to mechanical difficulties in getting a revolving breaker box absolutely true, and to the complex electrical action of such instruments.



Igniter with detail view showing interrupter and cam.

252-R

the actuating cam, not through a relay of springs, etc.

Another thing, a break from maximum saturation to zero is quicker than a break accomplished by building the saturation of the primary coil from zero to maximum. The high tension spark resulting from such a break is most intense, and of the greatest value in securing rapid flame propagation, for flame propagation with a spark delivered synchronously is dependent on the quality of the spark.

It is a simple matter to trace the electrical action of Connecticut Automatic Ignition. Contrasted with the complex and intricate action of the magneto, Connecticut Automatic Ignition manifests a remarkably simple mode of operation, electrically as well as mechanically.

CONNECTICUT TELEPHONE & ELECTRIC COMPANY, Inc.

MERIDEN CONNECTICUT

Observe these Yacht-like Lines

MUCH has been said by car builders about yacht-like lines, but they really never existed—or could exist—with a four-door body. But here they are—sweeping, graceful, unbroken from the bow of the bonnet to "midships."

The KisselKar two-door body is a greater advance in construction than was the four-door body over the old "open front."

The introduction of the four-door body accomplished but one thing—it improved the looks of the car.

The KisselKar Two-Door again beautifies the car and at the same time adds infinitely to its comfort and convenience.

Look at those big 26-inch doors and the aisle between the front seats—consider how these features add to the pleasure of motoring. Ample room to get in and out and provision for passing from the rear to the front seats without leaving the car.

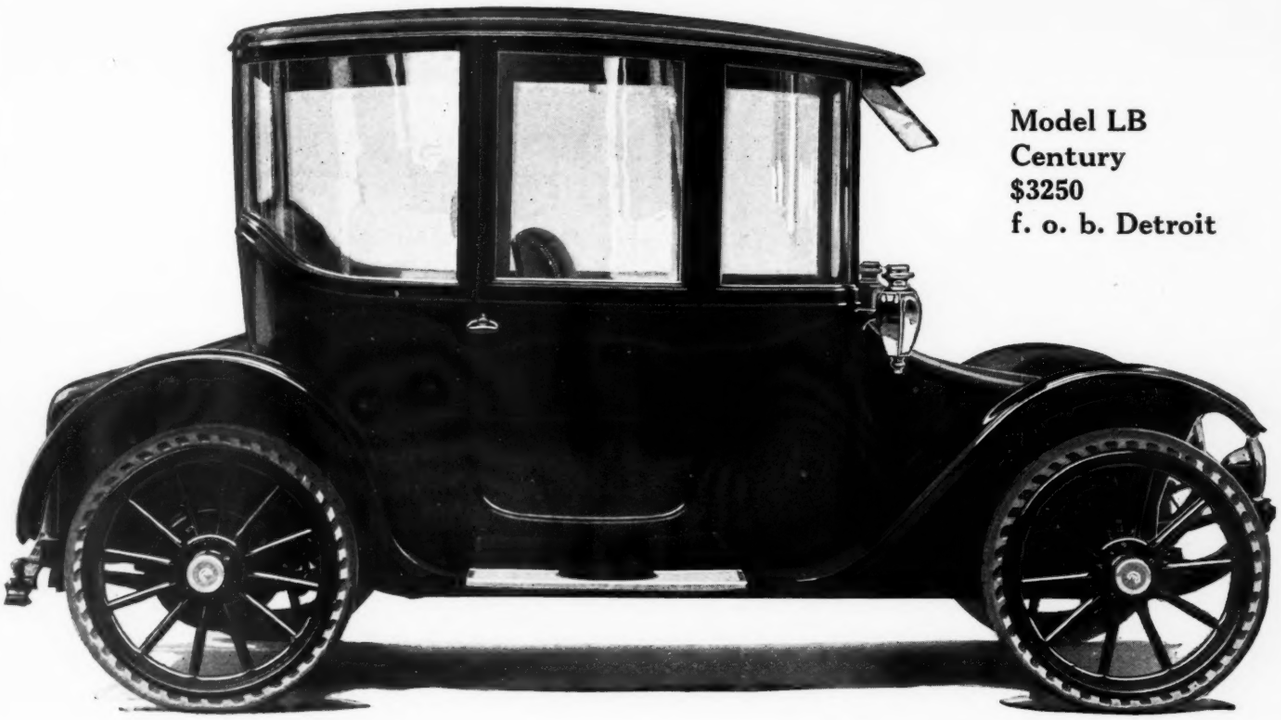
The new 48 "Six" chassis, on which this two-door tonneau is mounted, is mechanically the best KisselKar ever built. Four-door body on this chassis is optional—you can buy either type for $2350. Wire wheels $70 more.

Kissel Motor Car Co., 122 Kissel Ave., Hartford, Wis.

BOSTON, NEW YORK, CHICAGO, MILWAUKEE, KANSAS CITY, MINNEAPOLIS, ST. PAUL, DALLAS, SAN FRANCISCO, LOS ANGELES, OAKLAND, Philadelphia, Detroit, Houston, El Paso, Washington, Baltimore, Nashville, Duluth, Buffalo, Pittsburg, Hartford, Conn.; New Haven, Albany, Troy, Rochester, Providence, Cincinnati, Newark, Montreal, Quebec, Toronto, Winnipeg, Calgary and 300 other principal points throughout America.

KISSELKAR

Every Inch a Car



Model LB
Century
$3250
f. o. b. Detroit

CENTURY ELECTRICS

This is the latest Century that is creating the "disturbance" in the electric car field

CENTURY Electrics have always been designed and laid out irrespective of price. The dominating idea has always been to perfect the best electric ever built. The only question always asked of every piece of material and every part being "is it the *best?*" If it was the best from every standpoint it was deemed worthy to go into Century construction.

And that is why the Century always *stands up* and why three years' service in the hands of hundreds of users in every section of the country contributes unfaltering testimony to the fact that the Century gives splendidly satisfactory service to every user.

And now everywhere it is conceded that this latest double-drive Century is the best looking electric car ever built. It has the graceful lines and the perfect proportions that mean beauty. Its finish is not surpassed by any car at any price and its appointments are luxurious and in perfect taste.

It has the "appeal to the eye" that wins buyers. It is at once distinctive and distinguished in appearance. It is the type of car that creates pride of ownership.

But Century success is founded on more than beauty, important though that is in the sale and purchase of an electric pleasure vehicle.

The "disturbance" created by this latest Century is based on mechanical superiority

This double-drive Century has many advantages that are not shared with any other car. And they are features that appeal to the experienced electric car buyer—especially when he knows that the Century is backed by a strong, financially sound organization that is a guarantee of the permanence of his investment—an assurance that SERVICE will never be lacking.

First in importance among these advantages is the

Century Magnetic Control

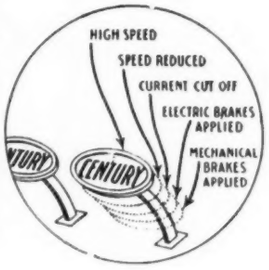
The Greatest Improvement Ever Made in Electric Cars

This marvelously simple device is revolutionizing the driving of an electric car. It is seemingly possessed of almost superhuman intelligence. It stops, starts, slows down, and speeds up the car—and does it without any fussing with keys, switches or levers. ONE FOOT PEDAL, MOVING UP AND DOWN WITHIN A RANGE OF THREE INCHES, DOES IT ALL.

There is nothing experimental about the Century Magnetic Control. It is built for us by the Cutler-Hammer Mfg. Co., Milwaukee, who have a world-wide reputation for making the finest electric-controlling devices money can buy. Cutler-Hammer electric controls are used in electric passenger and freight elevators of the most highly perfected types and on magnificent printing presses, whose cost runs into tens of thousands of dollars; they are used to control the movements of the big, heavy gun turrets on U. S. Battleships; to control the locks on the Panama Canal, and everywhere that positive, unfailing reliability is required and demanded.

This Century Magnetic Control is not a new thing awaiting the verdict of the public as to its success or practicability. It is the crowning achievement of an organization which, for twenty-three years, has devoted *all* its resources to the development and building of electric controls. Its application to the Century is exclusive. *You can get this Century Magnetic Control in no other electric car.*

Every perso' who operates the Century Magnetic Control (and everyone can learn how to do it in a few minutes) marvels at its simplicity. In a very short time every movement becomes automatic—instinctive. One does not have to think what to do next. The right foot does the right thing instinctively. No wonder those who drive the Century—who have threaded through the traffic of a big city without the slightest nervousness or strain—describe the Century as "The Car of Instinctive Control."



This Magnetic Control costs more but *it is the best* and that is why you find it in the Century.

The Century Electric Brakes—Another Big Feature

Closely and intimately connected to the Magnetic Control, are the Electric Brakes, which positively prevent skidding. *The Century Cannot Skid*—even on wet and slippery pavements with the electric brake applied *abruptly* when running at full speed. A demonstration of this feature awaits every prospective dealer and purchaser of a Century electric—and a demonstration is more powerful and convincing than a thousand arguments and reasons why.

This non-skidding feature is the last word in SAFETY.

And it's another reason why there is quick appreciation of the Century wherever the car is demonstrated. Ask us the "why" of this feature if you are interested. We will be glad to answer questions—still better pleased to give demonstrations.

The directions for changing the Century drive from front seat to rear or rear to front with utmost safety and dispatch can be given in eleven words

To change from rear to front—"TAKE OUT MASTER KEY AND INSERT IN HOLE AT FRONT SEAT." That's all. To change the other way, reverse the operation. Could anything be simpler? Can you imagine the pleasure in selling or driving an electric where instructions can be so briefly and so plainly given—so easily followed?

The Century has the simplest Duplex Drive in the world. Do you wonder that women who inspect it are "crazy about the Century?"

We submit that this is absolutely the best Duplex Drive obtainable. It had to be, to be adopted by the Century.

Triple Platform Spring Suspension

The spring suspension of the Century is recognized by experts as *ideal*. Users say the Century is the easiest riding electric built. Century springs are made from the finest Silico Manganese steel specially heat treated. The triple platform rear spring is 1¾ inches wide, sides 45⅝ inches long, cross spring 39½ inches long. Front springs are semi-elliptic 1¾ inches wide and 43 inches long. Total spring length is in excess of 216 inches. The best in spring suspension is none too good for the Century.

Low Body Suspension

Low body suspension—bringing the body close to the ground—adds to the feeling of safety—makes the center of gravity low—gives the maximum in "safety first."

Timken Axles, Front and Rear

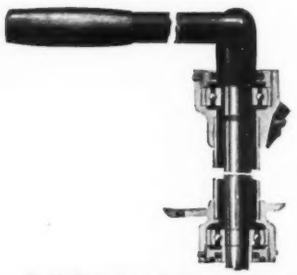
It is unnecessary to praise Timken axles to dealers and the public. It is known that they cost more because they are *better*. It is likewise known that a car has to be correctly engineered before it can get the co-operation of the Timken organization and the use of Timken Axles.

In building the Century we use the best at every point. Nothing less will do.

Century a Wonderfully Clean Car

Frequent doping and oiling is unnecessary. And yet every bearing and every moving part is perfectly lubricated. The springs work in graphited bushings, self-lubricating and noiseless. The steering columns are mounted on imported self-aligning ball bearings, the steering knuckles on extra large Timken roller bearings and even the brake rods are mounted on ball bearings. These bearings contribute to the remarkable ease of steering that is a feature of the Century and they require lubrication not oftener than once a season.

Those are some of the *big* features of the Century. Throughout you will notice thousands of minor refinements that show the care employed in designing every detail of the finest electric car built.



Ball Bearing Steering Post

Some live thoughts for live dealers—get them!

Do you begin to see why this double-drive Century is creating a disturbance in the electric car market? Why buyers everywhere are asking dealers "What do you know about the Century?"

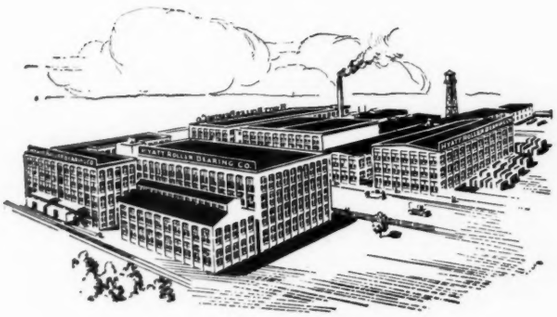
Do you really and truly appreciate what a big thing it means for any dealer to have a car that includes within itself so many striking points of superiority?

Do you begin to see why big electric car distributors and dealers everywhere are writing for territory? Why, even dealers who have never handled electrics are figuring on making Fall and Winter profits pushing the Century! Think for a moment of the absolute mechanical supremacy of the Century. Recollect that the Century *organization* is not a new nor an untried one—and this remarkable double-drive model is the unhampered development of three years' specialization and study.

Then get in touch with us immediately—you will want to be the dealer in your locality to have the sales rights for "the car of Instinctive Control." We suggest that you note the financial and manufacturing strength of our organization—and then—*apply at once* for territory.

CENTURY ELECTRIC CAR COMPANY

DETROIT, MICHIGAN



Every part of this large plant is devoted to the manufacture of Hyatt Quiet Bearings.

All of the latest labor saving devices—machine tools—"clock work" systems and efficiency methods are used—in fact the whole factory is operated in the most approved manner for the exclusive production of a dependable high grade product—Hyatt Quiet Bearings.

The Hyatt factory is the largest in the world devoted wholly to the manufacture of roller bearings.

Two books, one about motor car bearings in general for prospective purchasers, the other for automobile owners, will be sent on request.

"Hyatt Quiet Bearings"

HYATT ROLLER BEARING CO.
DETROIT, CHICAGO
NEWARK, N.J.

HY·FLEX·ROL

HIGH and LOW TENSION MAGNETOS

TRADE K-W MARK

MASTER VIBRATORS
ROAD SMOOTHERS
AUTO LOCKS

Make Every Road a Lincoln Highway

Don't wait for good roads. Make them. Get big, heavy car comfort from your light, economical Ford by Smoothing out the Rough Roads with

TRADE K-W MARK

ROAD SMOOTHERS

Reg. U. S. Pat. Off.

Quickly Applied to your Ford Car

THEY take the roughness out of the road and eliminate the pitching, swaying and vibration that racks and shortens the life of your car. K-W Road Smoothers seem to level off the high places and fill up the low places. Wherever you ride the bumps and jolts are gone—*ironed out* by the K-W Road Smoothers. They save tire and gasoline bills and add greatly to your safety and the life of your car.

The "anti-rebound air chamber" prevents the rebound of the spring. It is an essential feature and found ONLY in the K-W Road Smoothers.

The "anti-side-motion links" of the K-W Road Smoothers prevent side rocking and swaying when turning corners, and greatly reduce any tendency to skid.

There are no wearing parts or friction surfaces, consequently no oiling or packing in grease is necessary. No attention required after installation.

K-W Quality Throughout

K-W Road Smoothers are built of the very best materials obtainable. We use no cheap castings but instead, high-grade, heat-treated drop forgings. Our springs are made of electric smelted Chrome Vanadium steel—the most expensive spring steel that money will buy. They will not bend—they will not break—they will not lose their easy riding qualities because K-W quality is built into them all the way through. Phosphor bronze bushings are used throughout.

$25 SET OF FOUR ONE FOR EACH WHEEL

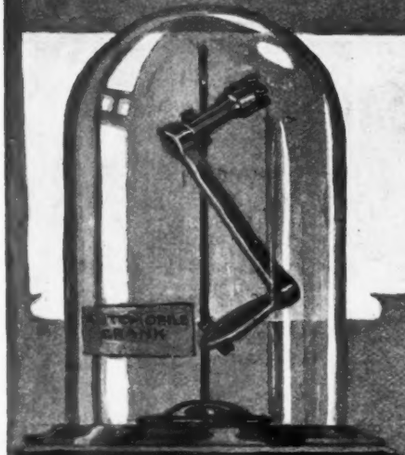
The principle is right—the design is right—the workmanship is right—and the price is right.

K-W Road Smoothers are sold by reliable dealers everywhere. If your dealer cannot supply you, we will send a set direct to you on receipt of price. Don't confuse these with ordinary shock absorbers. Write for free booklet—"Taking out the Bumps." We will gladly send it on request.

HEADLIGHTING OUTFITS

THE TRADE K-W MARK IGNITION Co
2833 CHESTER AVE CLEVELAND, OHIO, U.S.A.

SPARK COILS
SPARK PLUGS



How About Your FORD

It is rapidly becoming a curiosity

It is a GOOD car, but with a Starter it is BETTER.

The BOSTON STARTER

This simple Ford Starter, so easily operated that a ten-year-old can use it, is now recognized as the greatest addition 1914 has made to the Ford Car.

A Ford is unquestionably a splendid little machine, sturdy, speedy, and always ready to do its duty, but it requires what most modern cars are built to avoid—**cranking.**

THE BOSTON STARTER ELIMINATES THE ONLY OBJECTIONABLE FEATURE OF RUNNING A FORD CAR

We set about improving the Ford because it is such an exceptionally good car and this is the only place where we found it could be improved. Add a BOSTON STARTER to your Ford and have all that any man could wish.

The Boston Starter may be obtained from your dealer and he will put it on for you.

If your dealer or garage doesn't handle it send us his name and we will send you prices and descriptive booklet, or ship the starter direct to him for installation on your car.

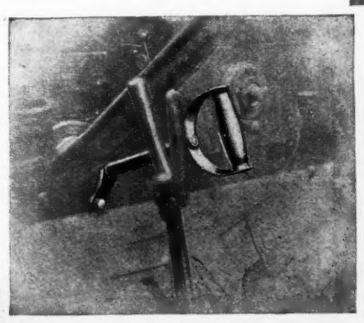
MANUFACTURED BY

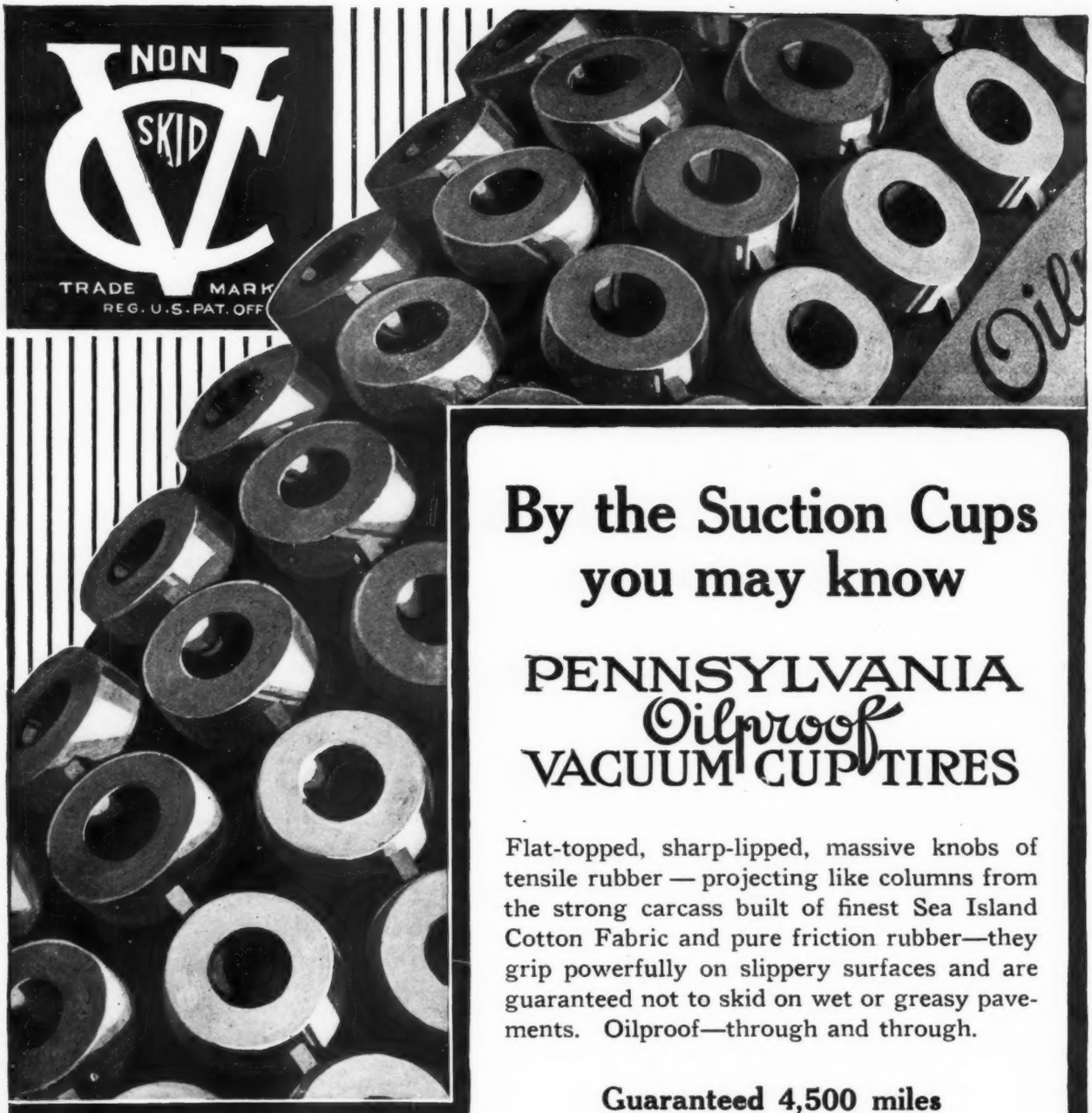
Automatic Appliance Co. 164 Columbus Ave., Boston, Mass. 1876 Broadway, New York, N. Y.

DISTRIBUTED BY

BALTIMORE, MD., Robert W. Butler, 4529 Park Heights Ave.
BUFFALO, N. Y., Frank X. Irr, 253 Allen Street.
LOUISVILLE, KY., Boston Starter Company of Kentucky.
LOS ANGELES, CAL., J. R. Bradford, 1044 South Olive St.
SAN FRANCISCO, CAL., J. R. Bradford, 1451 Van Ness Ave.
SCHENECTADY, N. Y., Dorp Auto Company, 307 State St.
DENVER, COLO., Bert E. Clark, 1616 Broadway.
IOWA FALLS, IOWA, Stiles & Lansing.
SEATTLE, WASH., L. E. Miller, 723 E. Pike St.
MILWAUKEE, WISCONSIN, Ford Supply Company, 221 Seventh Street.
RICHMOND, VA., Chemi Company, 629 E. Main Street.
DETROIT, MICH., Wilson-Schroeter Agency, 1249 Woodward Avenue.
PORTLAND, OREGON, Wm. G. Dunbar, 331 Ankeny St.
ST. PAUL, MINNESOTA, Boston Starter Company, 102 W. Fairfield Ave.
CHICAGO, ILL., Fred Allen Auto Supply Co. 1610 Michigan Ave.

Automobile Sundries Co., 18 Broadway, New York, N. Y.
Sole Distributors for Export.





By the Suction Cups you may know

PENNSYLVANIA Oilproof VACUUM CUP TIRES

Flat-topped, sharp-lipped, massive knobs of tensile rubber — projecting like columns from the strong carcass built of finest Sea Island Cotton Fabric and pure friction rubber—they grip powerfully on slippery surfaces and are guaranteed not to skid on wet or greasy pavements. Oilproof—through and through.

Guaranteed 4,500 miles —and averaging double

DEALERS should let us have their V. C. orders NOW—before the mid-season rush prevents our usual prompt service.

Pennsylvania Rubber Company

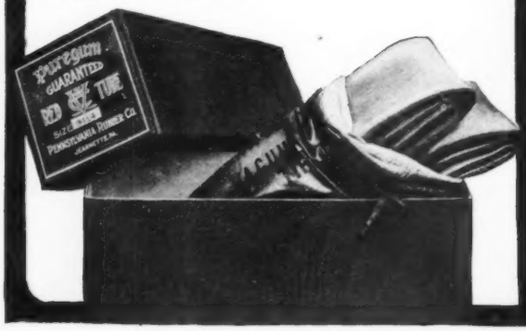
Jeannette, Pa.

New York, Chicago, Cleveland, Boston, Pittsburgh, San Francisco, Seattle, Dallas, Los Angeles, Detroit, St. Paul, Atlanta, Minneapolis, Omaha, Kansas City, Mo.

An Independent Company with an Independent selling policy

Pure Gum Red Inner Tubes

Just what their name implies — absolutely pure rubber with necessary antimony for color and cure. NO MINERAL to make weight or weaken.



The Stewart Speedometer
doubles the pleasure of driving your "FORD"

YOU cannot possibly know what your "Ford" can do unless a Stewart Speedometer tells you.

How fast will it take a certain hill on "high"? *How fast* will it travel along on the level? *How slow* can you throttle down in traffic? *How many miles* do you get from a gallon of gasoline—of oil? *How many miles* do you get out of your tires? *How far* have you driven by the end of the season? These are the questions that put the real fun into motoring—and the Stewart Speedometer answers every one of them *exactly.*

It's a real, "Magnetic Type" Stewart with special equipment for attaching to your "Ford." And it only costs $12 complete. It has a 60 mile rotating speed dial, 10,000 mile season odometer, 100 mile trip odometer, with device for resetting to any mile or tenth of a mile, jeweled bearings, case in deep jet lacquer with polished brass trim to match your Ford car.

Don't put off the pleasure of having a Stewart Speedometer on your "Ford." Get this Stewart Speedometer TODAY—from your Ford dealer, or from any jobber, supply dealer, garage man, or direct from any of our Branches or Service Stations. If bought at our Branches the installation is made free.

30 Days Free Trial
Have a Stewart Speedometer put on your "Ford" *now.* Try it and watch it 30 days. If you are not satisfied at the end of that time, take it back and your money will be promptly refunded.

Stewart-Warner Speedometer Cor'

Executive Offices: 1930 Diversey Blvd., Chicago
Factories: Chicago and Beloit, Wisc.
17 Branches. Service Stations in all cities and large towns.

Firestone

Quick-Detachable Demountable RIMS

Partial List of Car Manufacturers Using Firestone Rim Equipment

Abbott	Moline
Case	National
Chandler	Norwalk
Chevrolet	Packard
Cole	Pathfinder
Crawford	Peerless
Crescent	Peugeot
Croxton	Pope
Davis	Premier
Havers	Pullman
Haynes	Simplex
Hudson	Singer
Imperial	Speedwell
Jackson	Stafford
Kline	Stearns
Lexington	Stewart
Locomobile	Touraine
Marion	Velie
Marmon	White
McFarlan	Winton
Meteor	Zimmerman
Mitchell	

Proof In Public Favor

Nothing else in the way of car equipment has been so conclusively proved superior in its class as have Firestone Rims.

Seven years of satisfaction to car manufacturer and car owner—while rims have come and gone—and still come and go. That is one of the guide posts that should bring you to Firestone Rims now.

Six nuts to loosen! No complicated parts—no trouble—no delay. This is the "cinch" that thousands of motorists brag about.

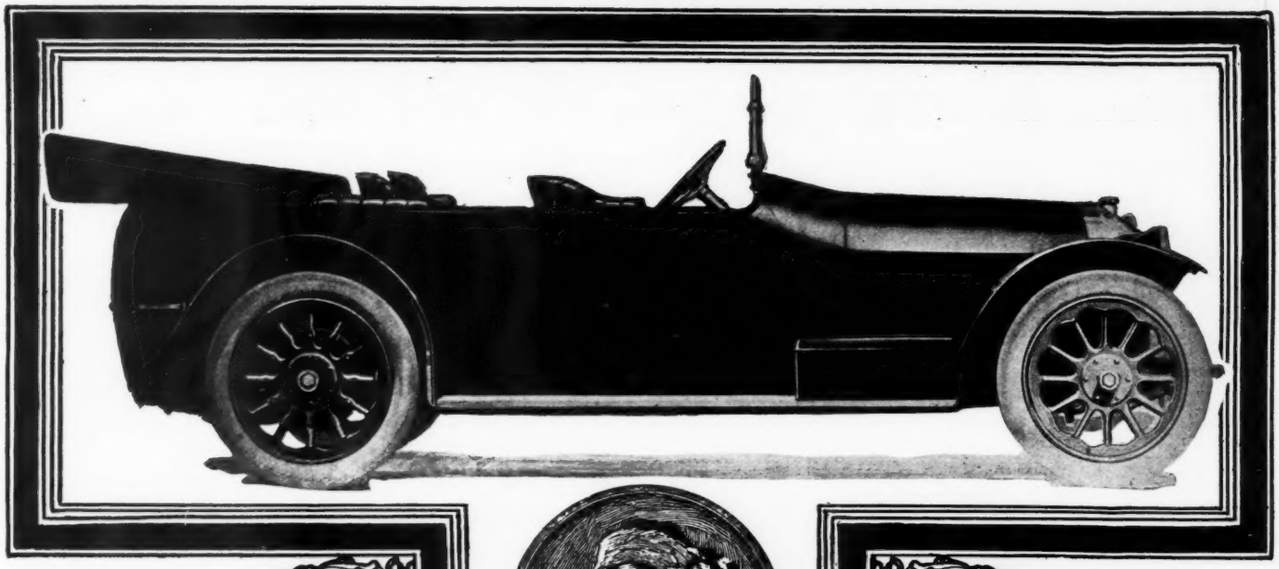
But all this simplicity is far from "simple" at the factory. It is the result of designing and building, or work and experiment unceasing up to the present day perfection.

5 types—Clincher and Straight-Side—All interchangeable on same felloe band.

Firestone Tire & Rubber Co., Akron, Ohio

"America's Largest Exclusive Tire and Rim Makers"

Branches and Dealers Everywhere



PATHFINDER

PICK YOUR LINE RIGHT

If you are building a permanent and profitable automobile sales business, you must pick your line right. Salesmanship must be backed by good goods, priced right, to insure your success.

Pick a line of Sixes because the greatest number of real automobile buyers are demanding Sixes. Pick a line, the models of which are priced within reason, because automobile buyers no longer relish the idea of paying exorbitant prices even for good Sixes.

The Pathfinder line is made up of two six-cylinder models, Daniel Boone $2222, Leather Stocking $2750. One a light Six, the other a big Six.

They are both perfect cars, and each gives service, each gives speed and power together with comfort and style not equaled by any other car, four or six, approaching the price mark that they have established.

These are the reasons why the Pathfinder line offers the basis for your success and this basis is supplemented by the most intelligent selling plan ever devised for the practical merchandising of motor cars.

Write us for particulars—and the plan

MOTOR CAR MANUFACTURING CO.

1130 Division St., Indianapolis, Ind.

187 A

One Hundred Sound, Substantial, Permanent Money-Making Opportunities for One Hundred Sound, Substantial Men—Automobile Dealers

The story is unusually interesting.

We—the makers of Moline-Knight 4-cylinder automobiles—are ready to "talk business" with a group of the best type of dealers.

DO YOU KNOW the Moline-Knight car?

DO YOU KNOW the men who make it?

DO YOU KNOW that the Moline-Knight people are making and delivering more automobiles with Knight Engines than any other car maker in America who has adopted the Knight motor?

Do you know that these cars are a constant delight to the men who bought them?

We have a wonderful asset to give to a good dealer.

The Moline-Knight selling agency is that asset—and it has great value because the car is right—and the Knight motor principle as we use it will grow.

The 338 hour test of the Automobile Club of America was the clinching argument for Moline-Knight—the story of that test is fascinating. (Send for A. C. A. official report.)

It helps good dealers sell the cars.

Are you in the motor car business today? Are there men in your town who will buy at home if you show them a great car at a moderate price?

We will have 1200 marvelous Moline-Knight cars to sell at $2400 each at retail.

Who is going to sell them?

The 100 men we sell.

We want 100 men who know the Moline-Knight Engine, and who are enthusiastic about its possibilities.

We want men who have a local market for a car, moderate in price, at the top in efficient performance, and giving supreme satisfaction to the men who buy them.

The market place for the Moline-Knight car is the show room of the dealer who has a following—who knows the needs of the business and professional men in his community—men who want something different, something better, something way beyond the ordinary poppet valve car.

The men who will buy Moline-Knight cars are the value getters in their own trading and value askers when they buy an automobile.

These men live in every town—they live in your town.

Are you ready to talk to a company with ample resources, a firm, sane, sensible merchandising policy—and the greatest $2400 automobile that ever ran over the road? Then say the word and we will answer with a proposition that is "Good business" for both of us.

We want dealers who will not buy six cars, if they should start with three—we are not speculators and we do not need speculators to sell Moline-Knight cars.

The man who answers this advertisement should be the man who sells his automobiles RIGHT, and who wants the RIGHT Automobile to sell. The man who will be in business tomorrow, next week, next year. Are you that man?

W. H. VanBrunt

President

THE MOLINE AUTOMOBILE COMPANY

EAST MOLINE, ILL.

METZ "22"

Introducing the New Fore Door Model Stream Line Body, Plate Glass Rain-Vision Wind Shield. The Ideal Car for Cross Country Driving or City Use.

$495 Equipped Complete

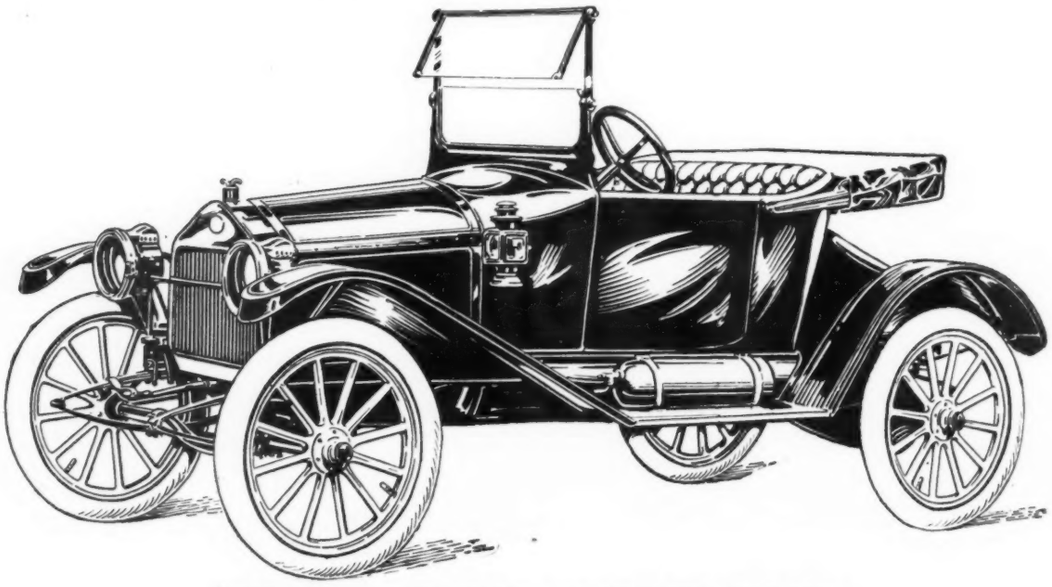
Big, roomy seats, with thick, tufted upholstery and deep cushions, built for luxurious comfort.

Four-cylinder 22½ H.P. water-cooled motor, Bosch high-tension magneto, Prest-O-Lite tank, best quality Goodrich clincher tires.

Fore doors of liberal dimensions, 20 inches wide.

Left-hand drive, with center control.

Gearless transmission—the kind that won the Glidden Tour.



WINNER OF THE GLIDDEN TOUR

The METZ "22" in open competition with cars of all makes and prices, won the last Glidden Tour, from Minneapolis, Minn., to Glacier National Park, Mont., the three METZ cars being the ONLY cars that held *perfect scores*, without time extension or additional allowance of any kind, for the entire eight days of the contest. The METZ cars were the lowest priced cars in the tour, and they were the only cars in it that were equipped with *gearless transmission*.

Mr. Chas. H. Metz has been building cars of this type and developing their perfection, *sixteen years*. As a result, the METZ "22" is today the most *practical* car on the market, regardless of price, horse power, or any other qualification.

Write for New Catalog "J."

METZ COMPANY, WALTHAM, MASS.

METZ WINS!

WESTERN UNION TELEGRAM

METZ COMPANY, UNIONTOWN, PA., JUNE 18, 1914.
WALTHAM, MASS.

IN HILL CLIMBING CONTEST AT UNIONTOWN, PA., METZ WINS EVENT TWO AGAINST FIELD OF THIRTEEN SPECIAL RACING CARS, TIME FOUR MINUTES, THREE-FIFTHS SECONDS. KLINE SECOND, MERCER THIRD, CHANDLER FOURTH. FORD, MAXWELL, BUICK, OVERLAND, HUDSON IN ORDER NAMED. METZ ALSO WINS SECOND IN THE FREE FOR ALL CONTEST, BEATING FIFTEEN OF THE BIG SPECIAL RACING CARS, INCLUDING SIMPLEX, MERCEDES, PACKARD, MERCER, OLDSMOBILE, BUICK, STUTZ, LOZIER, ALL THE WAY FROM TWENTY-FIVE SECONDS TO ONE MINUTE AND TWENTY-TWO SECONDS. THIS THREE MILE CLIMB IS DECLARED TO BE THE MOST DIFFICULT IN THE COUNTRY.

CHAS. H. METZ.

Let Facts Mould Your Opinion

If any further evidence was needed of the superiority of *gearless transmission*, this latest performance of the *gearless* METZ "22" surely supplies it in overwhelming measure. METZ leads the leaders.

The METZ "22" is the most compactly built car in the world, and is extremely economical in operation and upkeep. METZ owners travel 28 to 32 miles on 1 gallon of gasoline, 100 miles on 1 pint of lubricating oil, and 10,000 to 12,000 miles on a single set of tires. It makes 50 miles per hour, and at hill climbing is unsurpassed. Its engine develops more horse power per 100 pounds of car weight than any of the big touring cars, and its gearless transmission does away entirely with gear trouble. It is easy to drive and easy to take care of; and it costs so little to buy it, and so little to run it, that it combines in greatest degree absolute *economy* with absolute *luxury*.

TO DEALERS

The demand for a small car that is reliable in performance and economical in operation, is increasing enormously. The new METZ "22" Fore-Door Model meets this demand precisely. We want a representative in every city and town. Be first in your section. Write us for terms and new Catalog "J."

METZ COMPANY, WALTHAM, MASS.

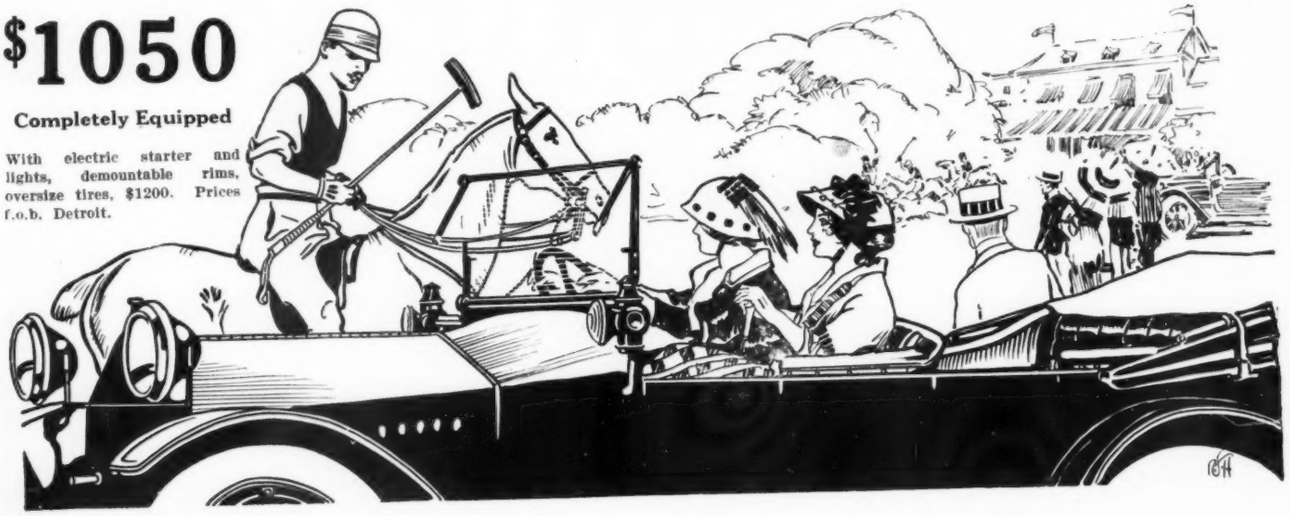
Hupmobile

The Car of The American Family

$1050

Completely Equipped

With electric starter and lights, demountable rims, oversize tires, $1200. Prices f.o.b. Detroit.



You Buy Excess Value

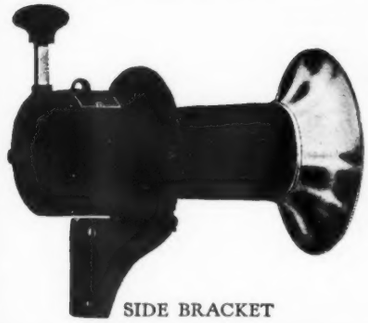
The Hup is excess value in the quality of its engineering and its materials.
Excess value in its low running cost—its long gas and oil and tire mileages.
Excess value in its continuous service.
In its almost total freedom from repair costs through defective or broken parts.
In the smartness of its low-hung, streamline design.
In its reputation, from one end of the country to the other, as a car of extraordinary excellence.

You Sell Excess Value

As a second-hand car the Hup stands higher than any other.
It brings a better price in any market, at any season.
Because it's a good car after one or two or three seasons of use.
Its steels are better, last longer and wear less.
So it runs as well as when new; it is full-powered and full of "go"; it picks up and gets away as quickly as it ever did.
In other words, Hup depreciation is less per thousand miles.
These are things you want in your car—low running cost, practically no repair cost, high selling value.
You get them in greater proportion in the Hup because of the way it's built.
Ask any Hupmobilist.

Hupp Motor Car Company, 1252 Milwaukee Avenue, Detroit

The Hand Klaxon $10



SIDE BRACKET

IN ADDITION to the regular bracket shown above, the Hand Klaxon is now supplied with a

SIDE BRACKET

By means of this the instrument may be attached to the outside of the body of a car. It is especially intended for use on trucks, taxi-cabs, etc.—that have no fore-doors. By reversing bracket the instrument may be attached to either side of car. In ordering specify "Hand Klaxon with Side Bracket."

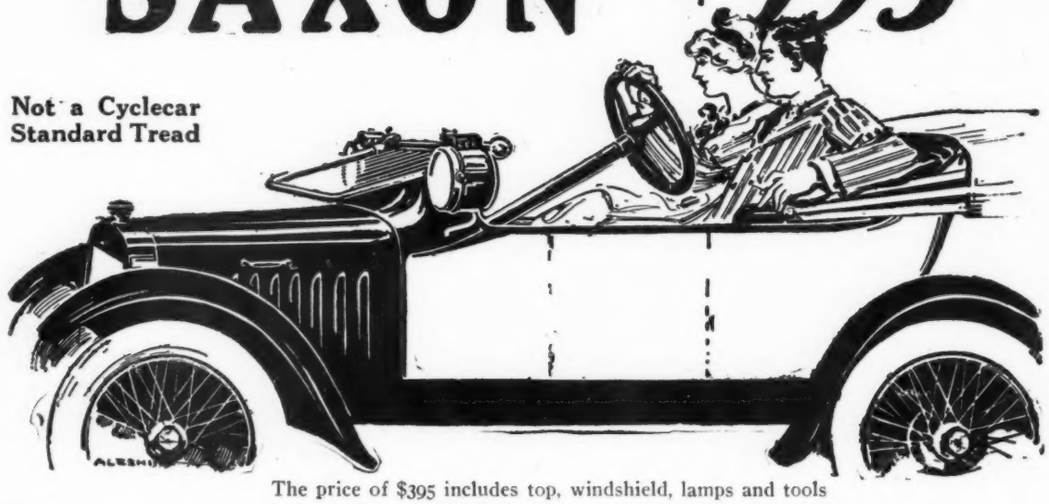
LOVELL-McCONNELL MFG·COMPANY
MAKERS OF THE "KLAXON"·NEWARK·N·J

This advertisement planned, written and set up entirely in the Klaxon Factory. Type composition by the Klaxon Press with "Klaxon" type especially designed by Goudy.

Please mention The Automobile when writing to Advertisers

SAXON $395

Not a Cyclecar
Standard Tread



The price of $395 includes top, windshield, lamps and tools

The Car of Widest Usefulness

There's no limit to the usefulness of the Saxon. It's the car for everybody. It's just the car for:

1. **Salesmen, contractors, real estate men.** For them the Saxon is a saving in time and money; a means of covering more ground and getting more business.
2. **Physicians.** Physicians are finding it possible to make more calls in their Saxons, independent of street cars, than they could make before.
3. **Public Service Corporations.** Gas, electric light, telephone companies are employing Saxons to enable their employees to get around quickly and economically —more so than in any other car.
4. **Caterers, grocers, decorators, farmers.** The Saxon doubles the value of their time.
5. **Those who already own a big car.** Much of their season's driving may be done in the Saxon.
6. **Those with the family spending the summer in the country.** The Saxon can be employed in running back and forth to the station, to the country club, or in a dozen other ways.
7. **Those who don't want to pay an extravagant price for a car.** In a Saxon two people can enjoy all the health and pleasure of driving that you get in a $1500 or $2000 car.

True Blue Saxon Making Good Everywhere

For all whose work takes them from place to place, the Saxon is the most wonderful car in the world. It performs as well as the highest priced cars. **It is more economical to buy—and to run—than any other car.**

34.53 miles per gallon of gasoline was the average made by more than 100 Saxon cars in as many cities—**a world's record in economy.** Each Saxon, in all sections of the country, on the same day, ran 200 miles without the motor stopping. All performances were vouched for by newspaper men who officiated as observers.

And the Saxon **stands up.** All over the country it is climbing the steepest hills; standing the strains of country driving; making good on the roughest roads. In Detroit a Saxon ran 135 miles a day for 30 days—a total of 4050 miles; **as far as** the average owner drives his car in a year.

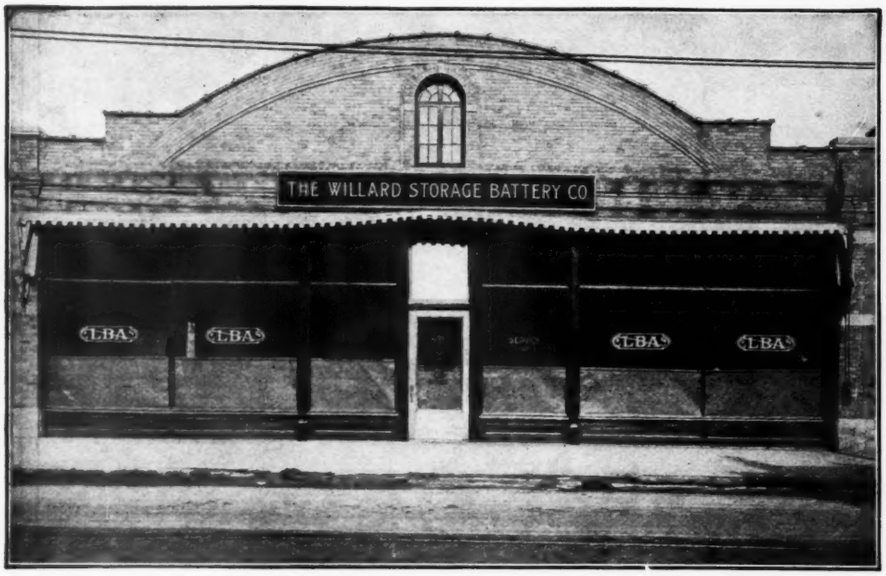
This same Saxon is now more than two-thirds of its way across the continent on a trip over the Lincoln Highway—the first automobile to cross the Lincoln Highway on a continuous run, and the lowest priced real automobile, **not a cyclecar,** ever to travel from coast to coast over any route.

The Saxon endures because every bit of material used in the Saxon is of high grade—equal, in all the essential parts, to the quality of material used in cars costing five to ten times as much.

Every Saxon car is thoroughly tested before it goes to you. The motors are run for hours on a block test in the Continental factory. Axles and transmissions are tested for accuracy, quietness and strength. And the completed car is given a **road test** as thorough as that of many cars of far higher price.

We urge you to act quickly. Ask for Saxon catalog. If you are a dealer, write and find out if your territory is still open.

SAXON MOTOR COMPANY, DETROIT—Department L



WHERE

LBA

TRADE MARK REGISTERED

STORAGE BATTERIES AND BATTERY SERVICE MAY BE OBTAINED IN DETROIT

Factory Branch at 736-740 Woodward Ave.

These photographs furnish but a faint idea of our facilities for affording service to manufacturers and LBA users in Detroit.

FOUR OTHER FACTORY-OPERATED BRANCHES carry complete stocks of batteries and parts and maintain ample charging and repair service.

OVER 200 SERVICE STATIONS in the United States and Canada insure the utmost satisfaction to users of LBA Storage Batteries everywhere.

LBA WILLARD STORAGE BATTERY CO. LBA

CLEVELAND, OHIO

New York Branch: 136 W. 52nd St.
Chicago Branch: 2241 Michigan Ave.
Detroit Branch: 736-740 Woodward Ave.
San Francisco Branch: 821 Monadnock Bldg.
Indianapolis Branch: 318 No. Illinois Ave.

SERVICE STATIONS IN ALL PRINCIPAL CITIES IN THE UNITED STATES, CANADA AND MEXICO.

CHARGING ROOM DETROIT BRANCH

46 CHARGING STATIONS

afford facilities for charging over 1000 Starting and Lighting Batteries at a time.

10,000 Batteries Carried in Stock at This Branch

(104)

THE CAPACITY TEST
DO YOU KNOW IT
?

THERE is a test to which every automobile may be put which may prove to be the capacity test.

Do you know it?

The "Capacity Test" is the motorist's dread. He unconsciously knows it exists, but probably never before has seen it expressed in words.

When you suddenly come upon a precipitous, winding hill, do you have a presentiment of not being able to negotiate it?

Do you fear it?

Then your unconscious self DOES know the "capacity test" and fears it. Some day you will point the nose of your car into it. Then what?

Summed up briefly, the "Capacity Test" is any trial to which a motor car may be put and fail to answer the touch of its master.

It is that test which no Stearns driver knows!

Hence Stearns owners are content. Stearns cars have the strength and inbuilt efficiency of seventeen years of successful motor manufacture to back them in every test. They easily overcome tests which prove to be the "Capacity Test" for cars not so well made.

THE F. B. STEARNS COMPANY
CLEVELAND, OHIO

YOU know the old story about the barking dog.

Well—a great many automobile valuations are marketed on the same basis. A lot of loud talking is done—but when the air clears and you happen to ask several pointed and practical questions (as for instance the length of the wheelbase, horsepower, kind of upholstery, etc.), the talk becomes very indistinct and faint.

The more you ask questions about the Overland and the more you compare the answers with corresponding points of other cars, the more you are impressed with the integrity and unusual value of the

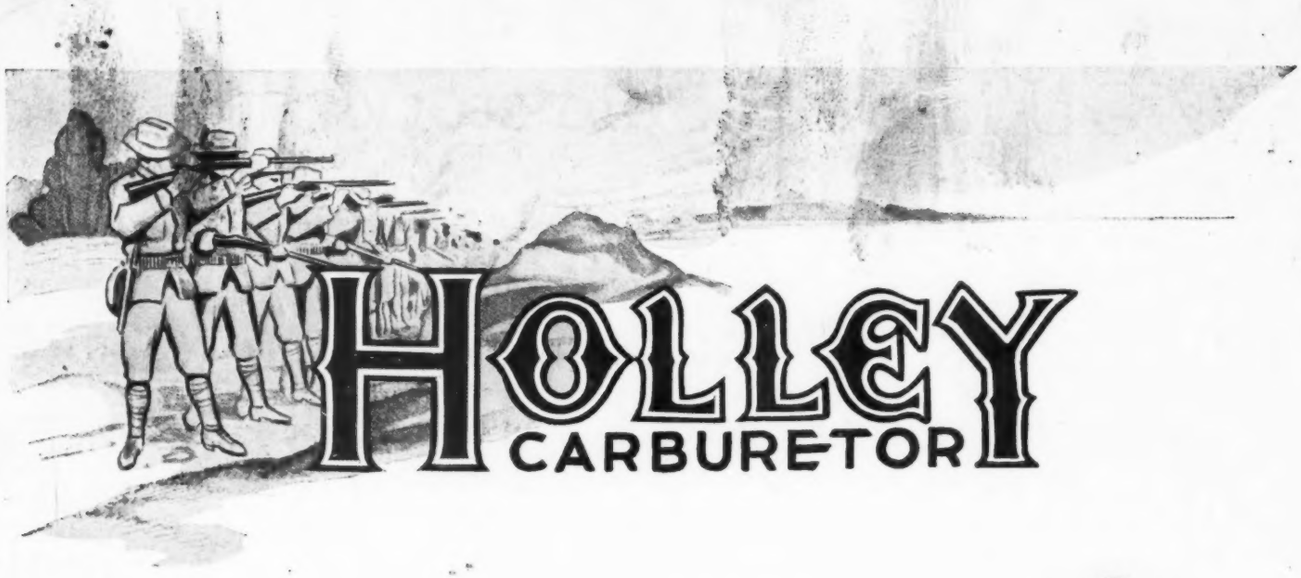
$950 *Completely equipped* **$1075** *With electric starter and generator.*

Prices f. o. b. Toledo, Ohio.

BRIEF SPECIFICATIONS: *Electric head, side, tail and dash lights Storage battery* | *35-horsepower motor 33 x 4 Q. D. tires 114-inch wheelbase* | *Mohair top, curtains and boot High-grade Speedometer* | *Clear-vision, rain-vision, windshield Electric horn*

The Willys-Overland Company, Toledo, Ohio

Manufacturers of the famous Overland Delivery Wagons, Garford and Willys Utility Trucks. Full information on request.



GUN makers have found springs most unreliable.

They have not been able to perfect a spring that is not affected by heat or cold.

They say that it is not unusual for the main spring of the gun to snap into pieces, even when the gun is not in use.

Springs become weak and treacherous.

According to the Encyclopedia Britannica, some military rifles have been absolute failures because of the unreliable features of their springs.

Springs are used in gun locks because nothing better has been found to take their place.

Springs have been used in carburetors for the same reason until recently.

The new self-adjusting Holley has no springs.

It depends entirely upon natural forces of gravity and air pressure for its operation—hence, it is accurate and reliable.

225,000 now in use.

One on your car will pay for itself in 5,000 miles of driving.

See our nearest dealer or write direct to

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